

**EVALUATION OF  
DESERT CAMOUFLAGE UNIFORMS  
BY GROUND OBSERVERS**

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**Evaluation of  
Desert Camouflage Uniforms  
by Ground Observers**

**1.0 INTRODUCTION**

The standard U.S. Army desert camouflage uniform is made in a pattern consisting of six colors. The predominant color areas are tan, khaki, light brown, and dark brown. Small light-tan areas outlined in black are scattered throughout the other color areas. This uniform was taken to Saudi Arabia in 1980 by the Belvoir Research, Development and Engineering Center,\* and viewed against multiple desert backgrounds. The uniform appeared dark in every location. Field reports to Forces Command and by the U.S. Marine Corps also indicated a dissatisfaction with the standard uniform camouflage pattern. In 1985, the Army Training and Doctrine Command tasked the Army Materiel Command to develop a new desert camouflage uniform. Using color data collected by Belvoir in Saudi Arabia and other Middle East and U.S. desert color information, Natick Research, Development and Engineering Center developed seven prototype uniforms. These were given to Belvoir to evaluate in the U.S. desert Southwest in 1986. This test<sup>1/</sup> determined that uniforms designated 4, 5, and 6 were the most effective in terms of blending with the background in the test sites investigated.

Using the 1986 test information as a basis, Natick then developed uniforms 8, 9, 10, and 11 for further evaluation. These uniforms, along with uniforms 4, 5, and 6 and the standard U.S. Army desert camouflage uniform, were evaluated by Belvoir in the U.S. desert Southwest in 1987. The quantitative analysis of their ability to blend with various Southwest desert backgrounds is the subject of this report.

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\*The uniforms were part of the camouflage test equipment taken to Saudi Arabia during a fact-finding trip to develop camouflage equipment for the Saudi Arabian National Guard.

## **2.0 PROCEDURE**

### **2.1 Test Uniforms**

A total of eight desert camouflage uniforms were evaluated:

- ♦ Uniform #1--Standard U.S. Army Desert Day Camouflage Pattern.

A six-color pattern now in use by the U.S. military consisting of the colors Light Tan 379, Tan 380, Light Brown 381, Dark Brown 382, Black 383, and Khaki 384.

- ♦ Uniform #4

A three-color pattern of Light Tan 379, Khaki 384, and Light Brown 381.

- ♦ Uniform #5

A three-color pattern of Light Tan 379, Tan 380, and Khaki 384.

- ♦ Uniform #6

A three-color pattern of Desert Tan 459, Khaki 384, and Light Brown 381.

- ♦ Uniform #8

A solid-color uniform of Tan 380.

- ♦ Uniform #9

A solid-color uniform of Khaki 384.

- ♦ Uniform #10

A three-color pattern of Khaki 384, brown\* and sand\*.

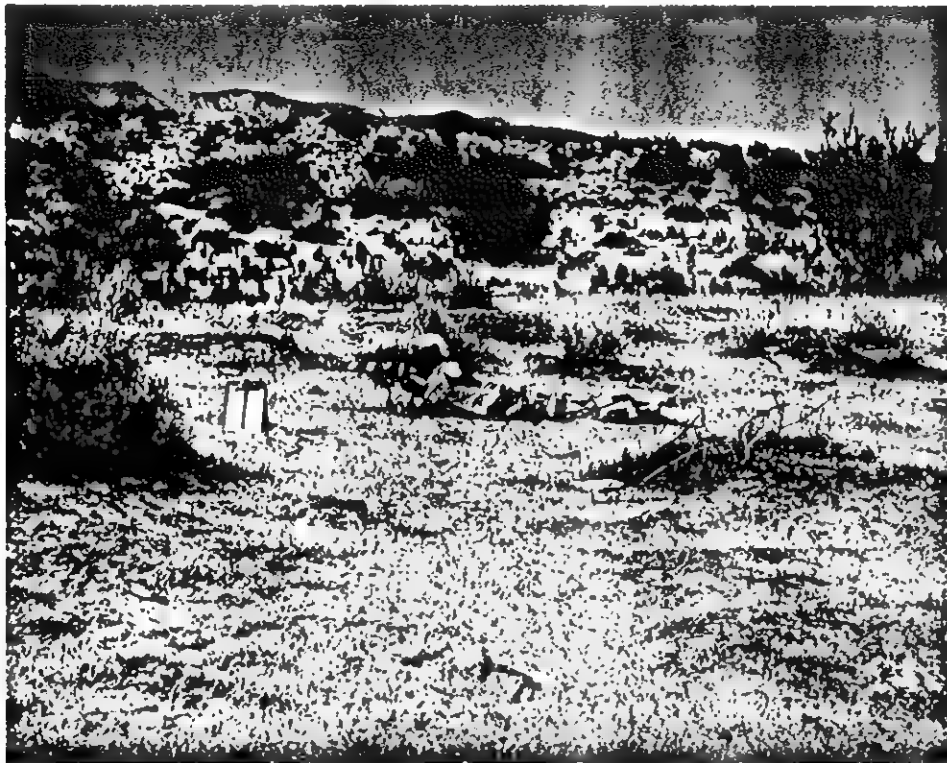
- ♦ Uniform #11

A two-color pattern of clay\* and Khaki 384.

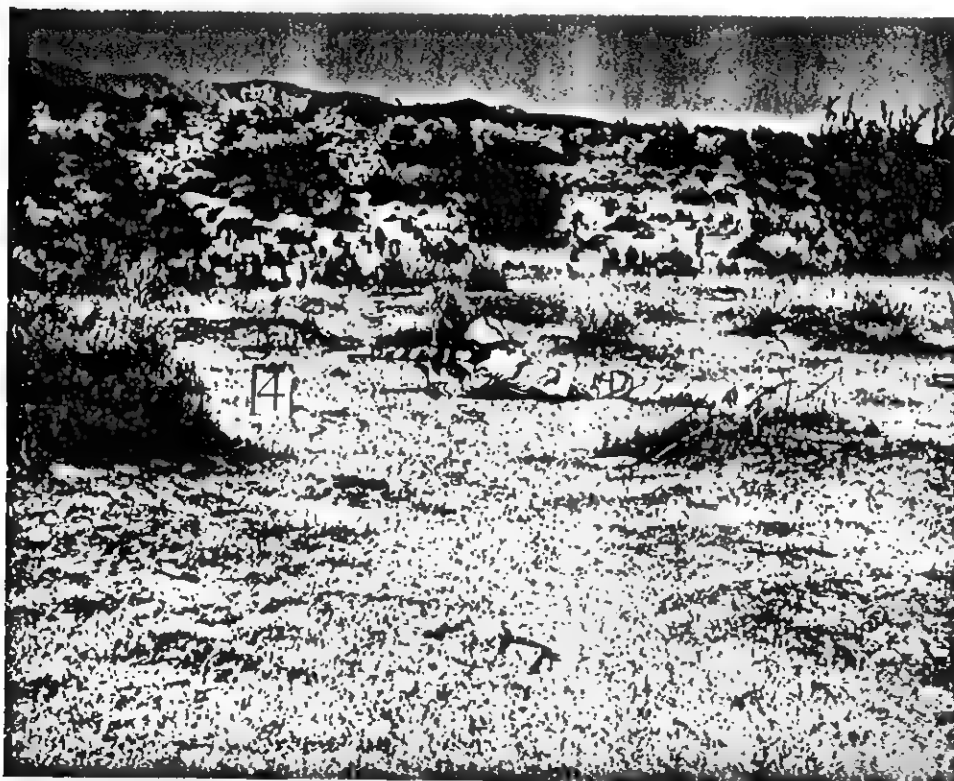
Note: Color numbers are Natick color designations

\*No numbers assigned

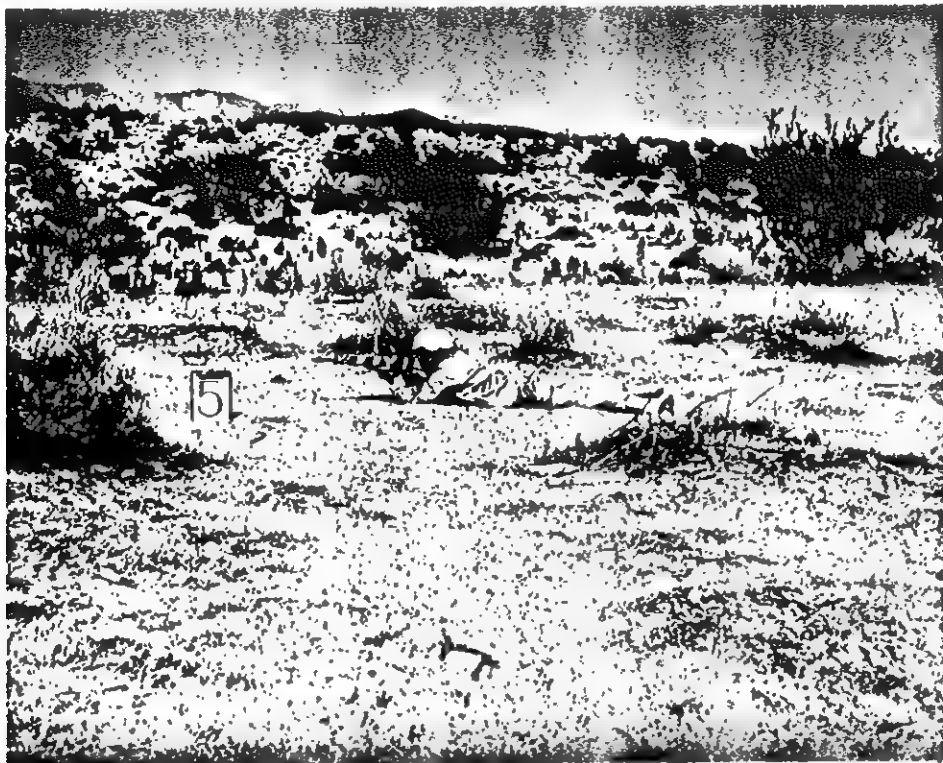
These uniforms, photographed at the Anza-Borrego State Park, CA, are shown in Figures 1-8 below. Fabric samples of the candidate uniforms are shown in Figure 9.



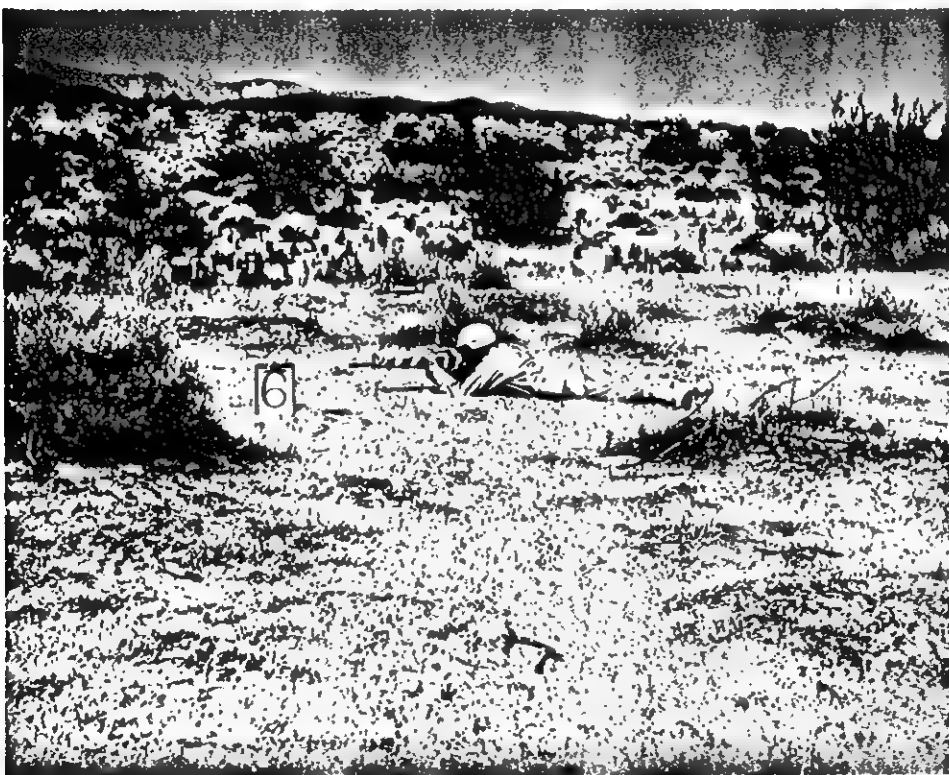
**Figure 1. Camouflage Uniform Number 1**



**Figure 2. Camouflage Uniform Number 4**



**Figure 3. Camouflage Uniform Number 5**



**Figure 4. Camouflage Uniform Number 6**

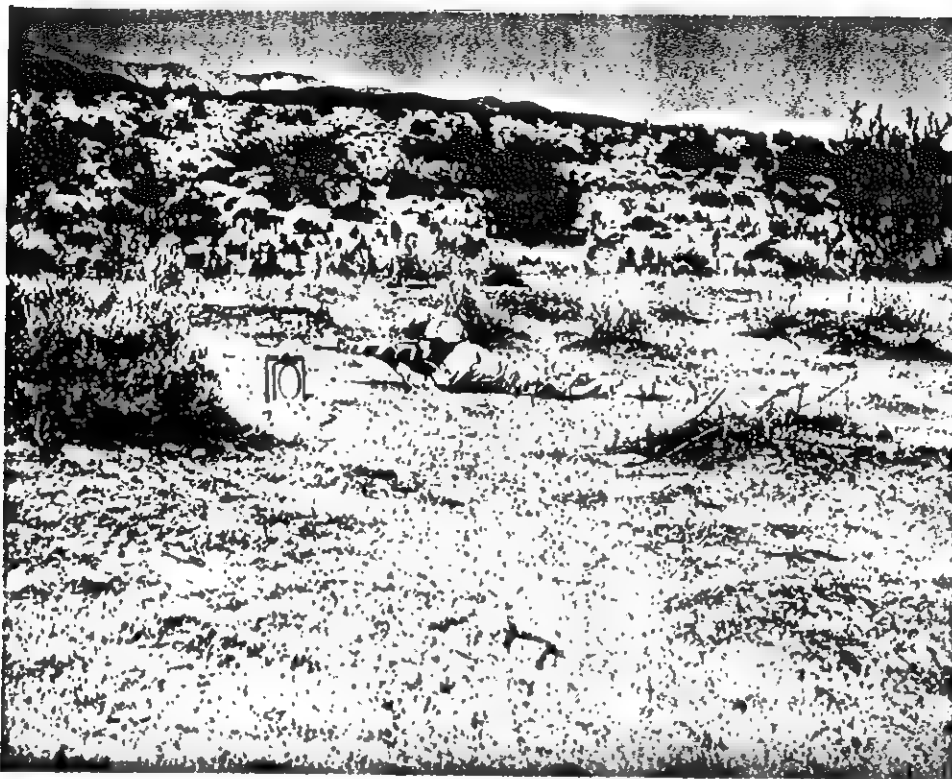


**Figure 5. Camouflage Uniform Number 8**

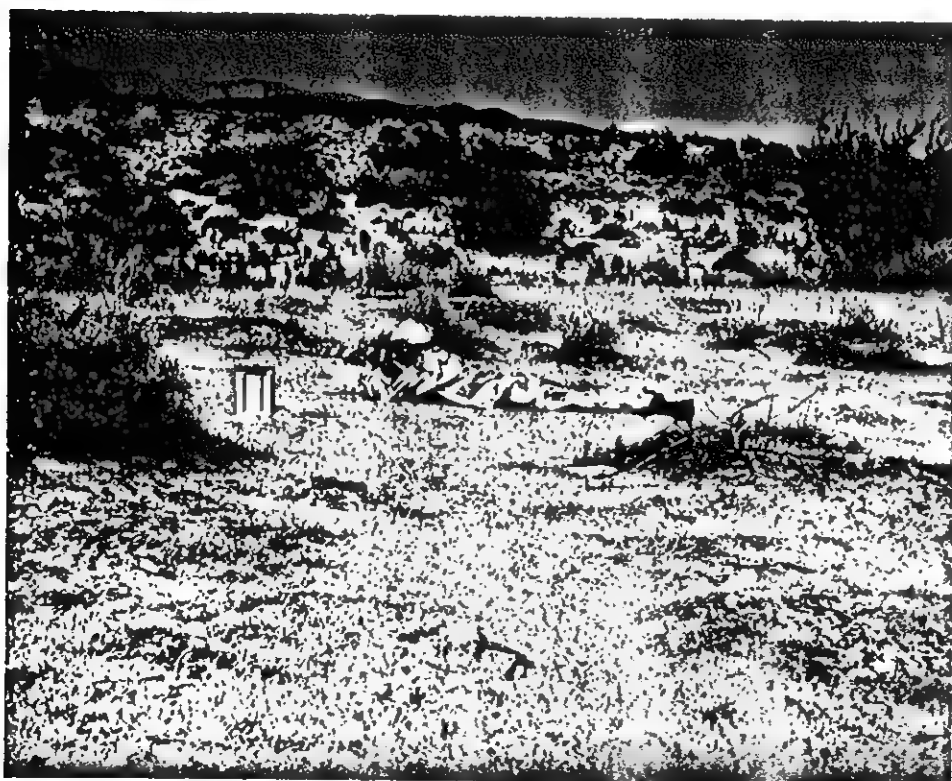


**Figure 6. Camouflage Uniform Number 9**

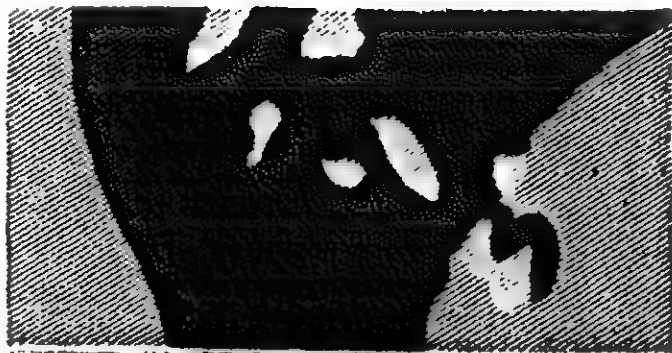




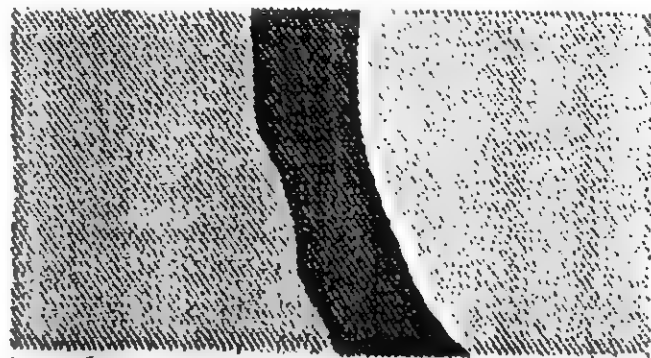
**Figure 7. Camouflage Uniform Number 10**



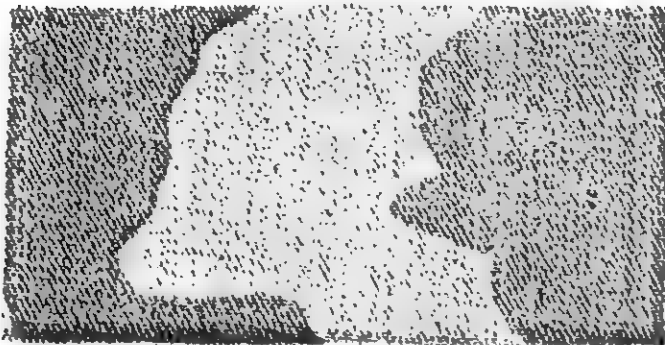
**Figure 8. Camouflage Uniform Number 11**



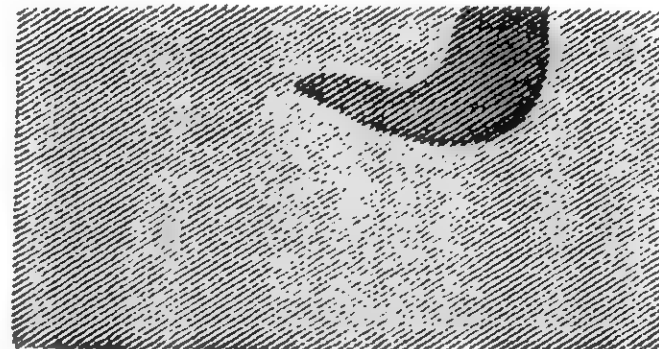
**Camouflage Uniform Number 1**



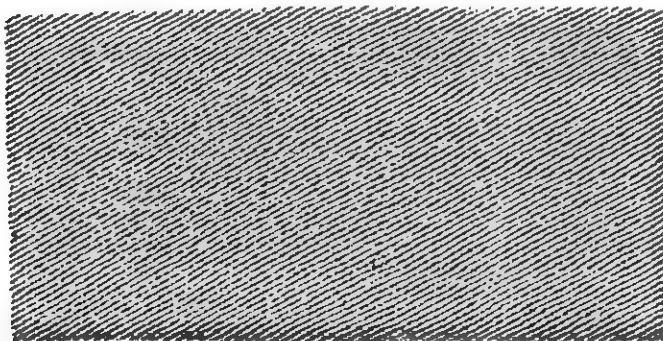
**Camouflage Uniform Number 4**  
*pattern adopted*



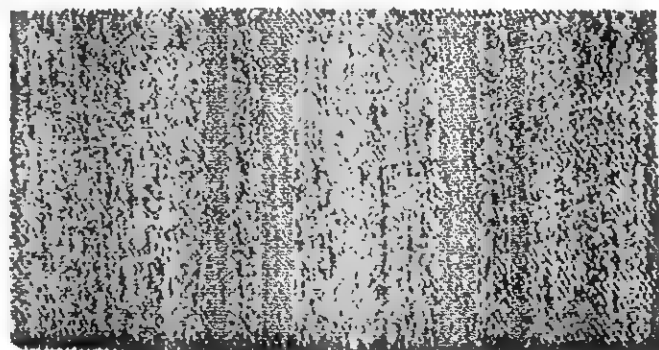
**Camouflage Uniform Number 5**



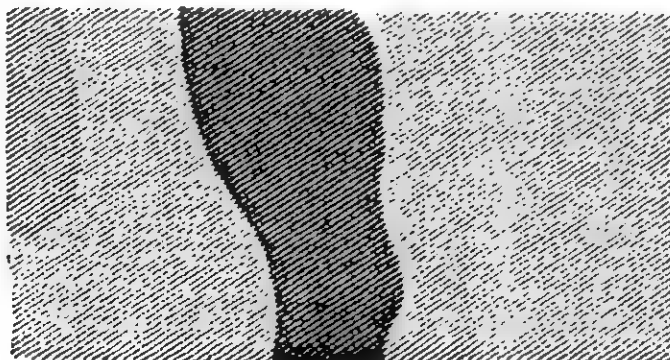
**Camouflage Uniform Number 6**



**Camouflage Uniform Number 8**



**Camouflage Uniform Number 9**



**Camouflage Uniform Number 10**



**Camouflage Uniform Number 11**

**Figure 9. Fabric Samples of Candidate Desert Camouflage Uniforms**



## 2.2 Test Sites

A total of ten sites in the U.S. desert Southwest were selected for the study. All the sites contained sparse vegetation similar to that found in areas of interest in the Middle East. The soil ranged in color from a light buff to gray and dark tan, and represented a good cross-sectional spectrum of different-colored desert backgrounds. The order of the ten sites as they will appear in this study is listed in Table 1.

**Table 1**  
**Site Order Identification**

Site #	Color	Location
1	Buff	Yuma Sand Dunes, AZ
2	Light Gray	Ogilby Road, Tumco, CA
3	Light Tan	Yuma Proving Grounds, AZ
4	Dark Beige Tan	Anza Borrego State Park, CA
5	Light Beige	Tank Trail, 29 Palms USMC Base, CA
6	Dark Tan	Salton Sea State Park, CA
7	Beige Tan	Anza Borrego State Park, CA
8	Light Beige Tan	Anza Borrego State Park, CA
9	Tan	Jean Dry Lake Bed, NV
10	Gray Tan	Rt. 15, Baker, CA

## 2.3 Test Subjects

The test subjects consisted of U.S. Marine Corps enlisted men from I MEF, Camp Pendleton, CA, and civilians from the U.S. Army Natick RD&E Center, Natick, MA, and the U.S. Army Belvoir RD&E Center, Fort Belvoir, VA. The number of observers varied from a high of 15 observers to a low of 10 observers. All subjects had at least a corrected visual acuity of 20/30 and normal color vision.

## **2.4 Test Procedure**

Both day and night evaluations were conducted at the same location. Ten sites were used for the day study, and six sites were used for the night study (sites 1, 2, 3, 4, 8, and 9). The remaining day sites were not run at night due to their remote locations. (A two-and-one-half-hour trip to reach the most remote sites was required.) The test procedures for the day and night studies were identical, except that the uniforms evaluated at night were viewed through AN/PVS-4 night-vision devices. The uniforms were viewed in all possible pairs (28). The viewing distance from the subject to the pair of uniforms was about 25 meters. For each pair, the observers were told to select the one uniform that best matched the surrounding background sand and rocks in terms of color. The observers were instructed to discount any shrubbery present. This instruction was necessary because there is very sparse shrubbery in the deserts of the Middle East as compared to the U.S. desert Southwest.

## **3.0 RESULTS**

### **3.1 Day Observations**

The eight uniforms shown in Figures 1-8 and described in Section 2.1 were evaluated as described in Section 2.4. The mean preference with associated standard error and 95% confidence intervals are shown for each site (Tables 2, 5, 8, 11, 14, 17, 20, 23, 26, and 29 and Figures 10-19). The higher the mean value, the better the uniform blended with the desert background as rated by the ground observers. Table 32 and Figure 20 identify how each uniform was rated as to its ability to blend, when averaged across all ten sites. Tables 3, 6, 9, 12, 15, 18, 21, 24, 27, and 30 show the analysis of variance<sup>2/</sup> performed to determine if there were significant differences in the ability of the desert camouflage uniforms to blend with the background for each of the ten sites. Table 33 shows the analysis of variance performed to determine significant differences for the camouflage uniforms averaged across all ten sites.

Tables 4, 7, 10, 13, 16, 19, 22, 25, 28, and 31 show the Individual Paired Comparison Test for the uniforms for each of the ten sites to determine which of the mean preferences for the ability of the uniform to blend with the desert differ significantly from each other. Table 34 shows the Paired Comparison Test for the camouflage uniforms averaged across all ten sites.

### 3.1.1 Site One--Day

**Table 2**  
Mean Preference Rating for Desert Background Blend  
and 95-Percent Confidence Intervals (Site 1)

Uniform	N	Mean	Standard Error	95% Confidence Interval Lower Limit	Upper Limit
1	13	0.6923	0.2083	0.2384	1.1462
4	13	4.4615	0.2912	3.8270	5.0961
5	13	5.4615	0.3511	4.6965	6.2265
6	13	2.7692	0.2809	2.1572	3.3812
8	13	5.6923	0.2371	5.1757	6.2089
9	13	1.3077	0.3469	0.5519	2.0634
10	13	3.4615	0.2912	2.8270	4.0961
11	13	2.0000	0.4804	0.9533	3.0465

**Table 3**  
Analysis of Variance for the Ability of the Camouflage  
Uniforms to Blend with the Desert Background (Site 1)

Source	Degrees of Freedom	Sum of Squares	Mean Square	F-Test	Level
Uniforms	7	318.1538	45.4505	34.0062	0.0000*
Error	96	128.3077	1.3365		
Total	103	446.4615			

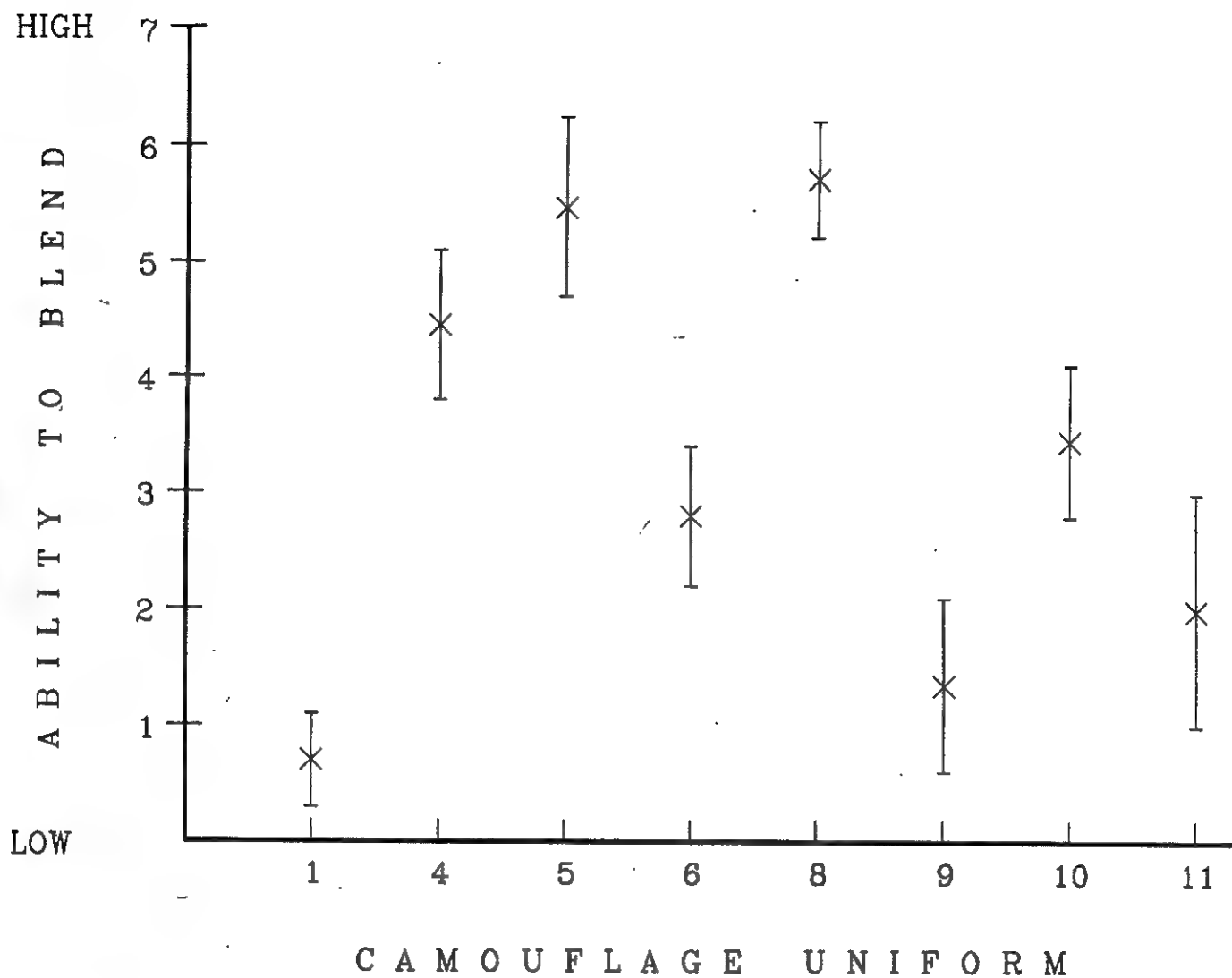
#### Bartlett's Test for Homogeneous Variances

Number Degrees of Freedom = 7

F = 1.611091      Significance Level = 0.12711

\*Significant at  $\alpha$  less than 0.001 level

Table 3 indicates that there are significant differences in the ability of the camouflage uniforms to blend with the desert background. The Bartlett's Test is not significant, so it is concluded that the levels of camouflage uniforms are from the same population.



**Figure 10. Camouflage Desert Uniform Ability to Blend with the Desert Background, Means, and 95-Percent Confidence Intervals (Site 1)**

**Table 4**  
**Individual Comparisons Identifying Which Camouflage Uniforms**  
**Differed Significantly from Each Other in the Ability**  
**to Blend with the Desert Background (Site 1)**

Uniforms	Uniform Comparison	Sum of Squares	F	Significance Level
#1 & #4	-3.76923	92.34615	69.094	0.00000***
#1 & #5	-4.76923	147.84615	110.619	0.00000***
#1 & #6	-2.07692	28.03846	20.978	0.00001***
#1 & #8	-5.00000	162.50000	121.583	0.00000***
#1 & #9	-0.61538	2.46154	1.642	0.17713
#1 & #10	-2.76923	49.84615	37.295	0.00000***
#1 & #11	-1.30769	11.11538	8.317	0.00461**
#4 & #5	-1.00000	6.50000	4.663	0.02922*
#4 & #6	1.69231	18.61538	13.928	0.00028***
#4 & #8	-1.23077	9.84615	7.367	0.00756**
#4 & #9	3.15385	64.65385	48.374	0.00000***
#4 & #10	1.00000	6.50000	4.863	0.02922*
#4 & #11	2.46154	39.38462	29.468	0.00000***
#5 & #6	2.69231	47.11538	35.252	0.00000***
#5 & #8	-0.23077	0.34615	0.259	0.61169
#5 & #9	4.15385	112.15385	83.914	0.00000***
#5 & #10	2.00000	26.00000	19.453	0.00002***
#5 & #11	3.46154	77.88462	58.273	0.00000***
#6 & #8	-2.92308	55.53846	41.554	0.00000***
#6 & #9	1.46154	13.88462	10.388	0.00161**
#6 & #10	-0.69231	3.11538	2.331	0.12929
#6 & #11	0.76923	3.84615	2.876	0.09224
#8 & #9	4.38462	124.96154	93.496	0.00000***
#8 & #10	2.23077	32.34615	24.201	0.00000***
#8 & #11	3.69231	88.61538	66.302	0.00000***
#9 & #10	-2.15385	30.15385	22.561	0.00001***
#9 & #11	-0.69231	3.11538	2.331	0.12929
#10 & #11	1.46154	13.88462	10.388	0.00161**

The following camouflage desert uniforms differed significantly from each other in their ability to blend with the background: 1 vs. 4, 1 vs. 5, 1 vs. 6, 1 vs. 8, 1 vs. 10, 1 vs. 11, 4 vs. 5, 4 vs. 6, 4 vs. 8, 4 vs. 9, 4 vs. 10, 4 vs. 11, 5 vs. 6, 5 vs. 9, 5 vs. 10, 5 vs. 11, 6 vs. 8, 6 vs. 9, 8 vs. 9, 8 vs. 10, 8 vs. 11, 9 vs. 10, and 10 vs. 11.

\*Significant at  $\alpha$  less than 0.05 level

\*\*Significant at  $\alpha$  less than 0.01 level

\*\*\*Significant at  $\alpha$  less than 0.001 level

### 3.1.2 Site Two--Day

**Table 5**  
**Mean Preference Rating for Desert Background Blend**  
**and 95-Percent Confidence Intervals (Site 2)**

Uniform	N	Mean	Standard Error	95% Confidence Interval	
				Lower Limit	Upper Limit
1	13	1.0000	0.2532	0.4484	1.5516
4	13	4.3846	0.3676	3.5838	5.1855
5	13	5.0769	0.3483	4.3181	5.8358
6	13	1.4615	0.2683	0.8769	2.0461
8	13	4.2308	0.3608	3.4447	5.0169
9	13	0.7692	0.2571	0.2092	1.3293
10	13	3.7692	0.3608	2.9831	4.5553
11	13	5.1538	0.4058	4.2696	6.0381

**Table 6**  
**Analysis of Variance for the Ability of the Camouflage**  
**Uniforms to Blend with the Desert Background (Site 2)**

Source	Degrees of Freedom	Sum of Squares	Mean Square	F-Test	Level
Uniforms	7	310.6154	44.3736	30.9031	0.0000*
Error	96	137.8462	1.4359		
Total	103	448.4615			

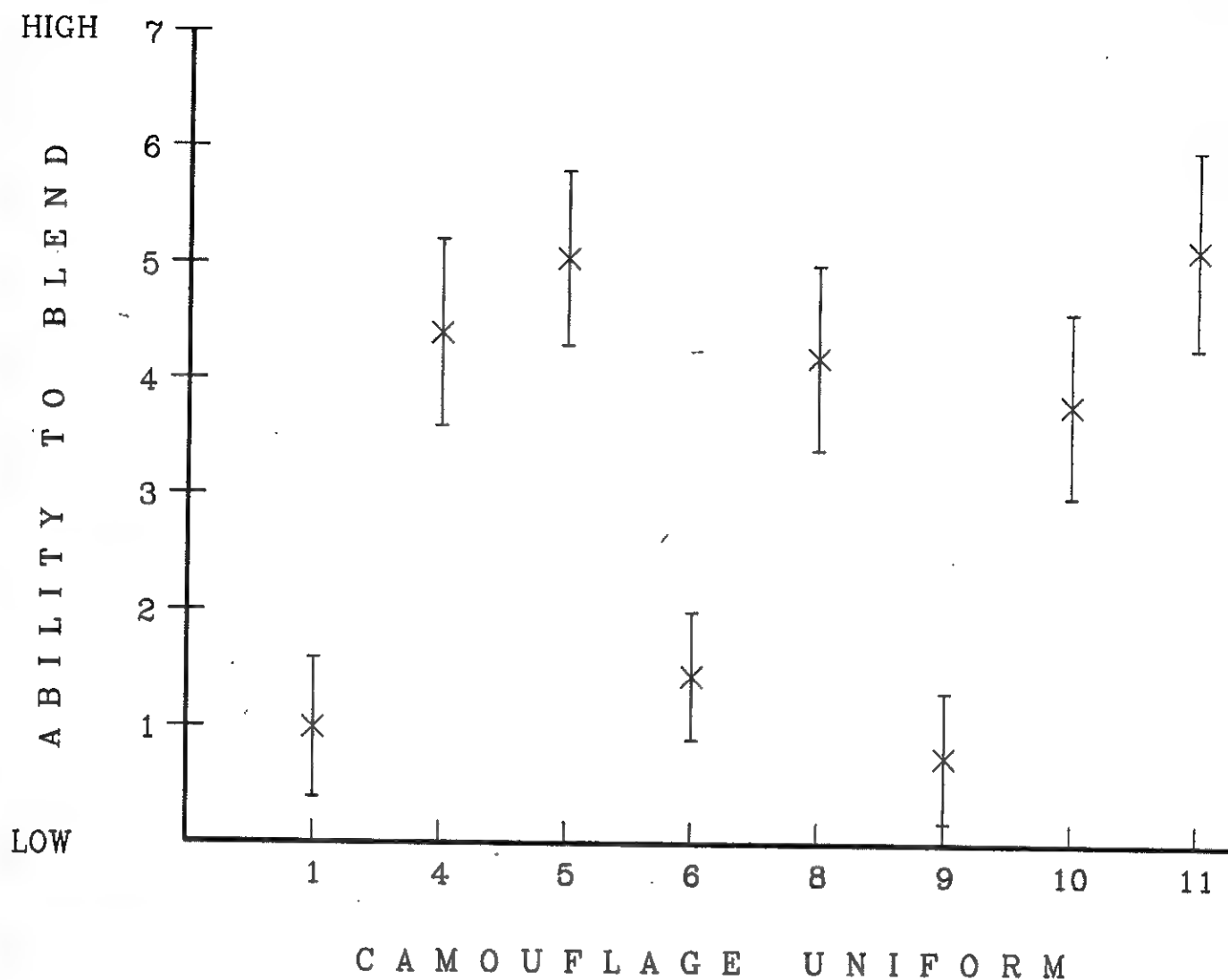
#### **Bartlett's Test for Homogeneous Variances**

Number Degrees of Freedom = 7

F = 0.769014      Significance Level = 0.61333

\*Significant at  $\alpha$  less than 0.001 level

Table 6 indicates that there are significant differences in the ability of the camouflage uniforms to blend with the desert background. The Bartlett's Test is not significant, so it is concluded that the levels of camouflage uniforms are from the same population.



**Figure 11. Camouflage Desert Uniform Ability to Blend with the Desert Background, Means, and 95-Percent Confidence Intervals (Site 2)**

**Table 7**  
**Individual Comparisons Identifying Which Camouflage Uniforms**  
**Differed Significantly from Each Other in the Ability**  
**to Blend with the Desert Background (Site 2)**

Uniforms	Uniform Comparison	Sum of Squares	F	Significance Level
#1 & #4	-3.38462	74.46154	51.857	0.00000***
#1 & #5	-4.07692	108.03846	75.241	0.000000***
#1 & #6	-0.46154	1.38462	0.964	0.32783
#1 & #8	-3.23077	67.84615	47.250	0.00000***
#1 & #9	-0.23077	0.34615	0.241	0.62421
#1 & #10	-2.76923	49.84615	34.714	0.00000***
#1 & #11	-4.15385	112.15385	78.107	0.00000**
#4 & #5	-0.69231	3.11538	2.170	0.14304
#4 & #6	2.92308	55.53846	38.679	0.00000***
#4 & #8	-0.15385	0.15385	0.107	1.00000
#4 & #9	3.61538	84.96154	59.170	0.00000***
#4 & #10	0.61538	2.46154	1.714	0.19261
#4 & #11	-0.76923	3.84615	2.679	0.10399
#5 & #6	3.61538	84.96154	59.170	0.00000***
#5 & #8	0.84615	4.65385	3.241	0.07400
#5 & #9	4.30769	120.61538	84.000	0.00000***
#5 & #10	1.30769	11.11538	7.741	0.00615**
#5 & #11	-0.07692	0.03846	0.027	1.00000
#6 & #8	-2.76923	49.84615	34.714	0.00000***
#6 & #9	0.69231	3.11538	2.170	0.14304
#6 & #10	-2.30769	34.61538	24.107	0.00000***
#6 & #11	-3.69231	88.61538	61.714	0.00000***
#8 & #9	3.46154	77.88462	54.241	0.00000***
#8 & #10	0.46154	1.38462	0.964	0.32783
#8 & #11	-0.92308	5.53846	3.857	0.05155
#9 & #10	-3.00000	58.50000	40.741	0.00000***
#9 & #11	-4.38462	124.96154	87.027	0.00000***
#10 & #11	-1.38462	12.46154	8.679	0.00378**

The following camouflage desert uniforms differed significantly from each other in their ability to blend with the background: 1 vs. 4, 1 vs. 5, 1 vs. 6, 1 vs. 8, 1 vs. 10, 1 vs. 11, 4 vs. 6, 4 vs. 9, 5 vs. 6, 5 vs. 9, 5 vs. 10, 6 vs. 8, 6 vs. 10, 6 vs. 11, 8 vs. 9, 9 vs. 10, 9 vs. 11, and 10 vs. 11.

\*Significant at  $\alpha$  less than 0.05 level

\*\*Significant at  $\alpha$  less than 0.01 level

\*\*\*Significant at  $\alpha$  less than 0.001 level



### 3.1.3 Site Three--Day

**Table 8**  
**Mean Preference Rating for Desert Background Blend**  
**and 95-Percent Confidence Intervals (Site 3)**

Uniform	N	Mean	Standard Error	95% Confidence Interval	
				Lower Limit	Upper Limit
1	14	0.5000	0.1738	0.1244	0.8756
4	14	4.5714	0.4412	3.6183	5.5246
5	14	5.0000	0.3477	4.2489	5.7511
6	14	2.2857	0.5181	1.1664	3.4050
8	14	4.5714	0.3095	3.9029	5.2400
9	14	1.0714	0.1951	0.6499	1.4929
10	14	4.0000	0.3631	3.2155	4.7845
11	14	4.0000	0.4322	3.0662	4.9338

**Table 9**  
**Analysis of Variance for the Ability of the Camouflage**  
**Uniforms to Blend with the Desert Background (Site 3)**

Source	Degrees of Freedom	Sum of Squares	Mean Square	F-Test	Level
Uniforms	7	292.8571	41.8367	22.4114	0.0000*
Error	104	194.1429	1.8668		
Total	111	487.0000			

#### Bartlett's Test for Homogeneous Variances

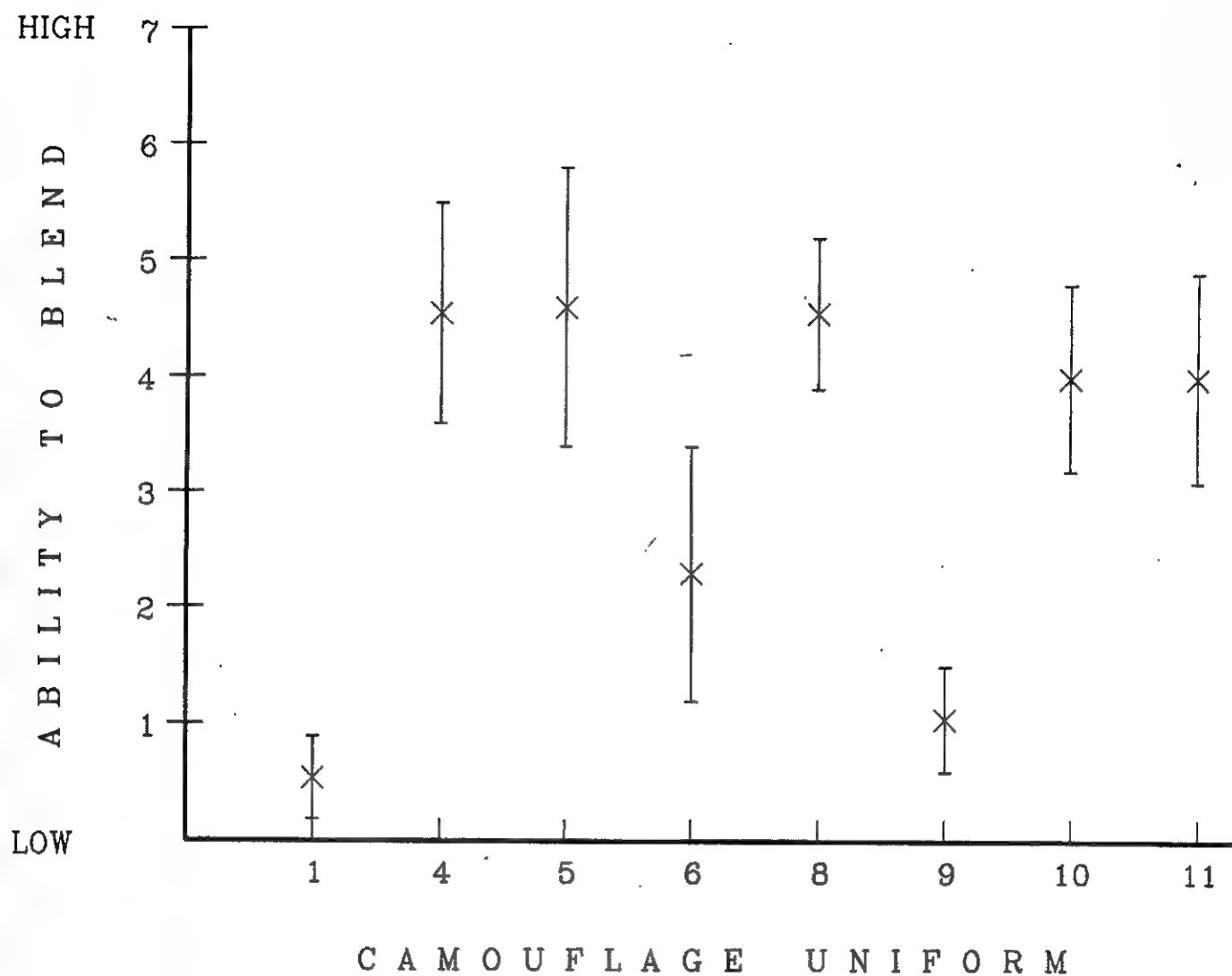
Number Degrees of Freedom = 7

F = 3.186559      Significance Level = 0.00227\*\*

\*Significant at  $\alpha$  less than 0.001 level

\*\*Significant at  $\alpha$  less than 0.01 level

Table 9 indicates that there are significant differences in the ability of the camouflage uniforms to blend with the desert background. The Bartlett's Test indicates that the variances for each uniform are not homogeneous, i.e., significantly different, so they are not necessarily from the same population.



**Figure 12. Camouflage Desert Uniform Ability to Blend with the Desert Background, Means, and 95-Percent Confidence Intervals (Site 3)**

**Table 10**  
**Individual Comparisons Identifying Which Camouflage Uniforms**  
**Differed Significantly from Each Other in the Ability**  
**to Blend with the Desert Background (Site 3)**

Uniforms	Uniform Comparison	Sum of Squares	F	Significance Level
#1 & #4	-4.07143	116.03571	62.150	0.00000***
#1 & #5	-4.50000	141.75000	75.934	0.00000***
#1 & #6	-1.78571	22.32143	11.957	0.00067***
#1 & #8	-4.07143	116.03571	62.159	0.00000***
#1 & #9	-0.57143	2.28571	1.224	0.26896
#1 & #10	-3.50000	85.75000	45.935	0.00000***
#1 & #11	-3.50000	85.75000	45.935	0.00000***
#4 & #5	-0.42857	1.28571	0.689	0.40761
#4 & #6	2.28571	36.57143	19.591	0.00002***
#4 & #8	0.00000	0.00000	0.000	1.00000
#4 & #9	3.50000	85.75000	45.935	0.00000***
#4 & #10	0.57143	2.28571	1.224	0.26986
#4 & #11	0.57143	2.28571	1.224	0.26896
#5 & #6	2.71429	51.57143	27.626	0.00000***
#5 & #8	0.42857	1.28571	0.689	0.40761
#5 & #9	3.92857	108.03571	57.873	0.00000***
#5 & #10	1.00000	7.00000	3.750	0.05427
#5 & #11	1.00000	7.00000	3.750	0.05427
#6 & #8	-2.28571	36.57143	19.591	0.00002***
#6 & #9	1.21429	10.32143	5.529	0.01971*
#6 & #10	-1.71429	20.57143	11.020	0.00108**
#6 & #11	-1.71429	20.57143	11.020	0.00108**
#8 & #9	3.50000	85.75000	45.935	0.00000***
#8 & #10	0.57143	2.28571	1.224	0.26986
#8 & #11	0.57143	2.28571	1.224	0.26986
#9 & #10	-2.92857	60.03571	32.160	0.00000***
#9 & #11	-2.92857	60.03571	32.160	0.00000***
#10 & #11	0.00000	0.00000	0.000	1.00000

The following camouflage desert uniforms differed significantly from each other in their ability to blend with the background: 1 vs. 4, 1 vs. 5, 1 vs. 6, 1 vs. 8, 1 vs. 10, 1 vs. 11, 4 vs. 6, 4 vs. 9, 5 vs. 6, 5 vs. 9, 6 vs. 8, 6 vs. 9, 6 vs. 10, 6 vs. 11, 8 vs. 9, 9 vs. 10, and 9 vs. 11.

\*Significant at  $\alpha$  less than 0.05 level

\*\*Significant at  $\alpha$  less than 0.01 level

\*\*\*Significant at  $\alpha$  less than 0.001 level

### 3.1.4 Site Four--Day

**Table 11**  
Mean Preference Rating for Desert Background Blend  
and 95-Percent Confidence Intervals (Site 4)

Uniform	N	Mean	Standard Error	95% Confidence Interval	
				Lower Limit	Upper Limit
1	11	1.4545	0.2817	0.8269	2.0821
4	11	4.7273	0.4879	3.6402	5.8143
5	11	4.5455	0.4545	3.5327	5.5582
6	11	0.9091	0.3682	0.0888	1.7294
8	11	3.8182	0.2635	3.2311	4.4053
9	11	1.2717	0.2371	0.7445	1.8009
10	11	3.2727	0.4066	2.3669	4.1786
11	11	5.4545	0.4126	4.5352	6.3739

**Table 12**  
Analysis of Variance for the Ability of the Camouflage  
Uniforms to Blend with the Desert Background (Site 4)

Source	Degrees of Freedom	Sum of Squares	Mean Square	F-Test	Level
Uniforms	7	123.2727	33.9740	22.0480	0.0000*
Error	80	237.8182	1.5409		
Total	87	361.0909			

#### Bartlett's Test for Homogeneous Variances

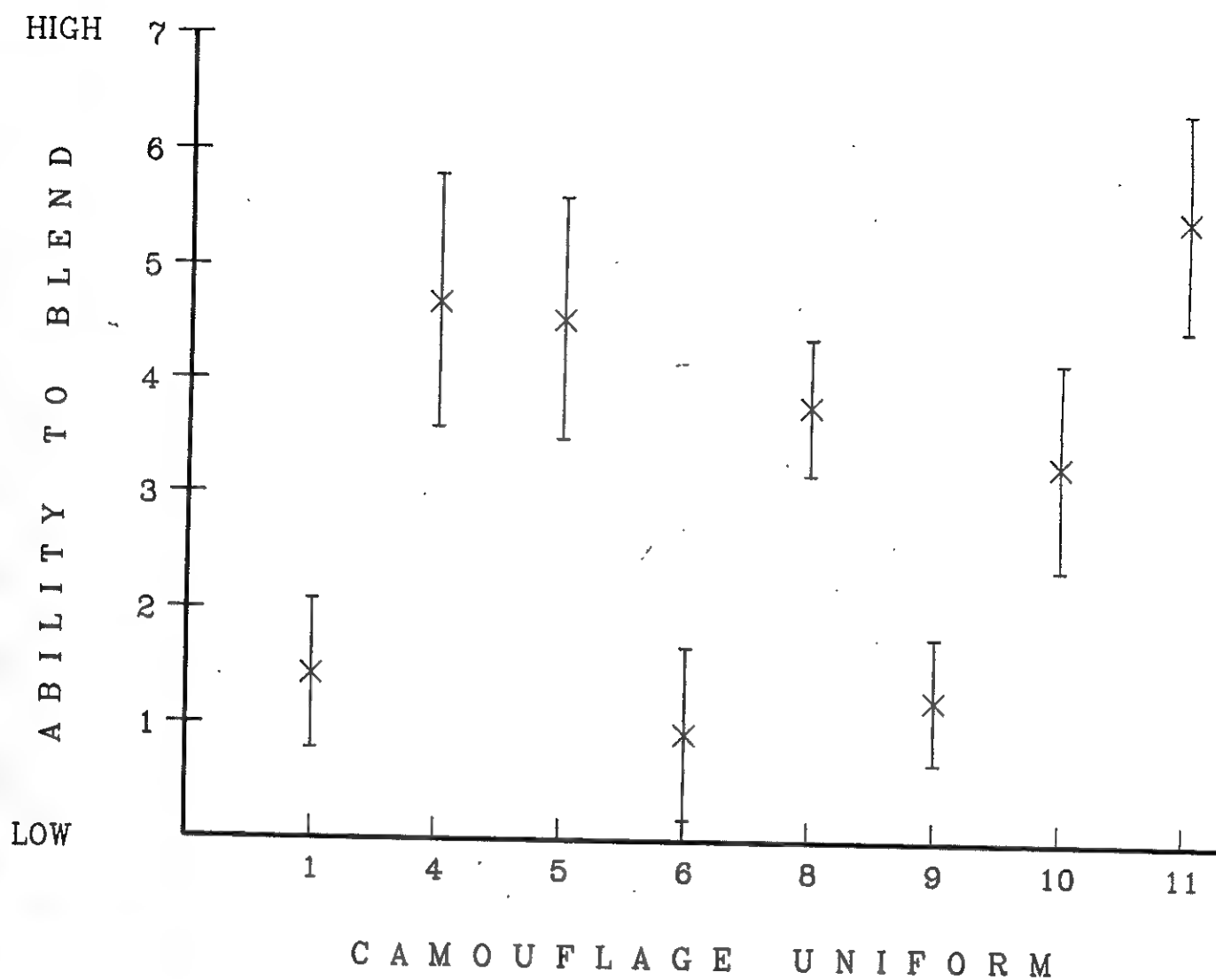
Number Degrees of Freedom = 7

F = 1.291535

Significance Level = 0.24995

\*Significant at  $\alpha$  less than 0.001 level

Table 12 indicates that there are significant differences in the ability of the camouflage uniforms to blend with the desert background. The Bartlett's Test is not significant, so it is concluded that the levels of camouflage uniforms are from the same population.



**Figure 13. Camouflage Desert Uniform Ability to Blend with the Desert Background, Means, and 95-Percent Confidence Intervals (Site 4)**

**Table 13**  
**Individual Comparisons Identifying Which Camouflage Uniforms**  
**Differed Significantly from Each Other in the Ability**  
**to Blend with the Desert Background (Site 4)**

Uniforms	Uniform Comparison	Sum of Squares	F	Significance Level
#1 & #4	-3.27273	58.90909	38.230	0.00000***
#1 & #5	-3.09091	52.54545	34.100	0.00000***
#1 & #6	0.54545	1.63636	1.062	0.30479
#1 & #8	-2.36364	30.72727	19.941	0.00002***
#1 & #9	0.18182	0.18182	0.118	1.00000
#1 & #10	-1.81818	18.18182	11.799	0.00081***
#1 & #11	-4.00000	88.00000	57.109	0.00000***
#4 & #5	0.18182	0.18182	0.118	1.00000
#4 & #6	3.81818	80.18182	52.035	0.00000***
#4 & #8	0.90909	4.54545	2.950	0.08840
#4 & #9	3.45455	65.63636	42.596	0.00000***
#4 & #10	1.45455	11.63636	7.552	0.00690**
#4 & #11	-0.72727	2.90909	1.888	0.17193
#5 & #6	3.63636	72.72727	47.198	0.00000***
#5 & #8	0.72727	2.90909	1.888	0.17193
#5 & #9	3.27273	58.90909	38.230	0.00000***
#5 & #10	1.27273	8.90909	5.782	0.01768
#5 & #11	-0.90909	4.54545	2.950	0.08840
#6 & #8	-2.90909	46.54545	30.206	0.00000***
#6 & #9	-0.36364	0.72727	0.472	0.49337
#6 & #10	-2.36364	30.72727	19.941	0.00002***
#6 & #11	-4.54545	113.63636	73.746	0.00000***
#8 & #9	2.54545	35.63636	23.127	0.00000***
#8 & #10	0.54545	1.63636	1.062	0.30479
#8 & #11	-1.63636	14.72727	9.558	0.00246**
#9 & #10	-2.00000	22.00000	14.277	0.00024***
#9 & #11	-4.18182	96.18182	62.419	0.00000***
#10 & #11	-2.18182	26.18182	16.991	0.00007***

The following camouflage desert uniforms differed significantly from each other in their ability to blend with the background: 1 vs. 4, 1 vs. 5, 1 vs. 8, 1 vs. 10, 1 vs. 11, 4 vs. 6, 4 vs. 9, 4 vs. 10, 5 vs. 6, 5 vs. 9, 5 vs. 10, 6 vs. 8, 6 vs. 9, 6 vs. 10, 6 vs. 11, 8 vs. 9, 8 vs. 11, 9 vs. 10, 9 vs. 11, and 10 vs. 11.

\*Significant at  $\alpha$  less than 0.05 level

\*\*Significant at  $\alpha$  less than 0.01 level

\*\*\*Significant at  $\alpha$  less than 0.001 level

### 3.1.5 Site Five--Day

**Table 14**  
**Mean Preference Rating for Desert Background Blend**  
**and 95-Percent Confidence Intervals (Site 5)**

Uniform	N	Mean	Standard Error	95% Confidence Interval	
				Lower Limit	Upper Limit
1	11	0.6364	0.1521	0.2974	0.9753
4	11	3.2727	0.3835	2.4181	4.1273
5	11	3.3636	0.4106	2.4488	4.2785
6	11	5.6364	0.2439	5.0928	6.1799
8	11	3.1818	0.3253	2.4571	3.9065
9	11	0.5455	0.3659	0.0000	1.3607
10	11	5.5455	0.2473	4.9944	6.0965
11	11	3.2727	0.4491	2.2722	4.2733

**Table 15**  
**Analysis of Variance for the Ability of the Camouflage**  
**Uniforms to Blend with the Desert Background (Site 5)**

Source	Degrees of Freedom	Sum of Squares	Mean Square	F-Test	Level
Uniforms	7	276.0000	39.4286	31.8322	0.0000*
Error	80	99.0909	1.2386		
Total	87	375.0909			

#### **Bartlett's Test for Homogeneous Variances**

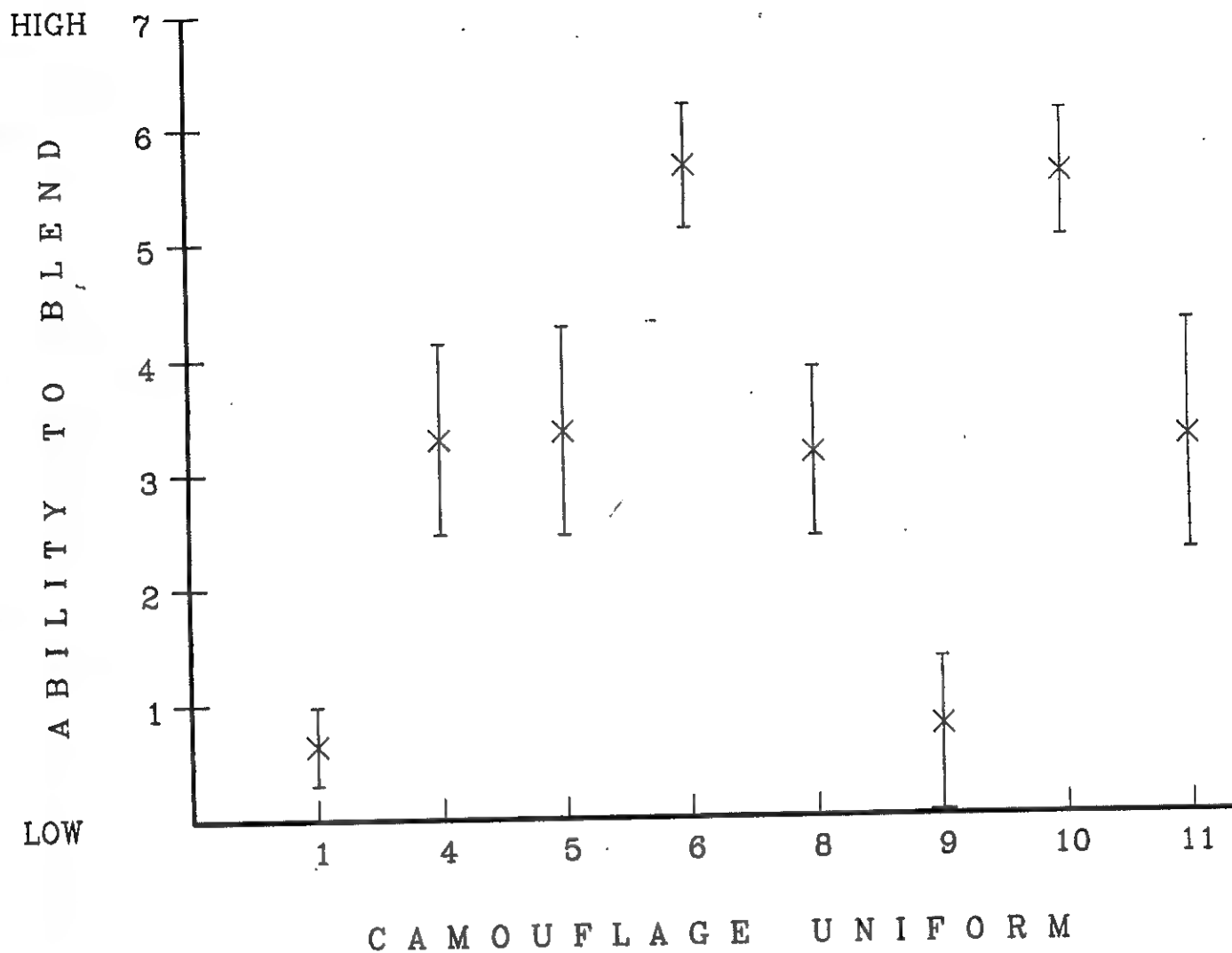
Number Degrees of Freedom = 7

F = 2.021279      Significance Level = 0.04877\*\*

\*Significant at  $\alpha$  less than 0.001 level

\*\*Significant at  $\alpha$  less than 0.05 level

Table 15 indicates that there are significant differences in the ability of the camouflage uniforms to blend with the desert background. The Bartlett's Test indicates that the variance for each uniform is not homogeneous, i.e., significantly different, so they are not necessarily from the same population.



one horizontal  
Scatter plot  
can x axis  
this one goes  
in Fig. 14 - original

**Figure 14. Camouflage Desert Uniform Ability to Blend with the Desert Background, Means, and 95-Percent Confidence Intervals (Site 5),**



**Table 16**  
**Individual Comparisons Identifying Which Camouflage Uniforms**  
**Differed Significantly from Each Other in the Ability**  
**to Blend with the Desert Background (Site 5)**

Uniforms	Uniform Comparison	Sum of Squares	F	Significance Level
#1 & #4	-2.63636	38.22727	30.862	0.00000***
#1 & #5	-2.72727	40.90909	33.028	0.00000***
#1 & #6	-5.00000	137.50000	111.009	0.00000***
#1 & #8	-2.54545	35.63636	28.771	0.00000***
#1 & #9	0.09091	0.04545	0.037	1.00000
#1 & #10	-4.90909	132.54545	107.009	0.00000***
#1 & #11	-2.63636	38.22727	30.862	0.00000***
#4 & #5	-0.09091	0.04545	0.037	1.00000
#4 & #6	-2.36364	30.72727	24.807	0.00000***
#4 & #8	0.09091	0.04545	0.037	1.00000
#4 & #9	2.72727	40.90909	33.028	0.00000***
#4 & #10	-2.27273	28.40909	22.936	0.00001**
#4 & #11	0.00000	1.00000	0.000	1.00000
#5 & #6	-2.27273	28.40909	22.936	0.00001***
#5 & #8	0.18182	0.18182	0.147	1.00000
#5 & #9	2.81818	43.68182	35.266	0.00000***
#5 & #10	-2.18182	26.18182	21.138	0.00001***
#5 & #11	0.09091	0.04545	0.037	1.00000
#6 & #8	2.45455	33.13636	26.752	0.00000***
#6 & #9	5.09091	142.54545	115.083	0.00000***
#6 & #10	0.09091	0.04545	0.037	1.00000
#6 & #11	2.36364	30.72727	24.807	0.00000***
#8 & #9	2.63636	38.22727	30.862	0.00000***
#8 & #10	-2.36364	30.72727	24.807	0.00000***
#8 & #11	-0.09091	0.04545	0.037	1.00000
#9 & #10	-5.00000	137.50000	111.009	0.00000***
#9 & #11	-2.72727	40.90909	33.028	0.00000***
#10 & #11	2.27273	28.40909	22.936	0.00001***

The following camouflage desert uniforms differed significantly from each other in their ability to blend with the background: 1 vs. 4, 1 vs. 5, 1 vs. 6, 1 vs. 8, 1 vs. 10, 1 vs. 11, 4 vs. 6, 4 vs. 9, 4 vs. 10, 5 vs. 6, 5 vs. 9, 5 vs. 11, 6 vs. 8, 6 vs. 9, 6 vs. 11, 8 vs. 9, 8 vs. 10, 9 vs. 10, 9 vs. 11, and 10 vs. 11.

\*Significant at  $\alpha$  less than 0.05 level

\*\*Significant at  $\alpha$  less than 0.01 level

\*\*\*Significant at  $\alpha$  less than 0.001 level

### 3.1.6 Site Six--Day

**Table 17**  
**Mean Preference Rating for Desert Background Blend**  
**and 95-Percent Confidence Intervals (Site 6)**

Uniform	N	Mean	Standard Error	95% Confidence Interval	
				Lower Limit	Upper Limit
1	11	0.9091	0.2113	0.4384	1.3798
4	11	4.4545	0.4545	3.4418	5.4673
5	11	4.2727	0.5735	2.9948	5.5506
6	11	3.2727	0.5409	2.0675	4.4779
8	11	3.7273	0.3328	2.9858	4.4688
9	11	0.7273	0.2727	0.1196	1.3349
10	11	4.9091	0.4146	3.9853	5.8329
11	11	3.1818	0.6298	1.7785	4.5852

**Table 18**  
**Analysis of Variance for the Ability of the Camouflage**  
**Uniforms to Blend with the Desert Background (Site 6)**

Source	Degrees of Freedom	Sum of Squares	Mean Square	F-Test	Level
Uniforms	7	190.1818	27.1688	12.1487	0.0000*
Error	80	178.9091	2.2364		
Total	87	369.0909			

#### Bartlett's Test for Homogeneous Variances

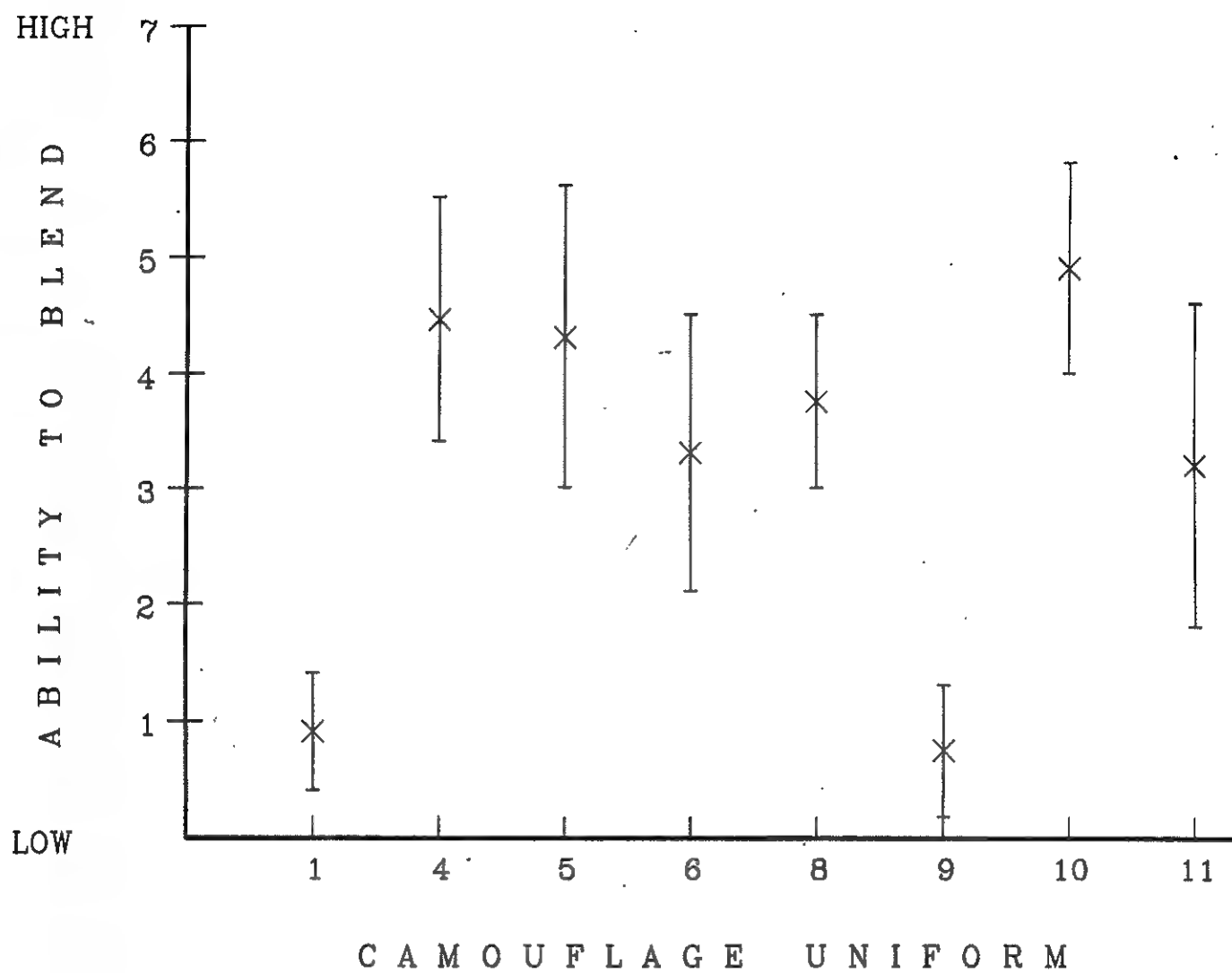
Number Degrees of Freedom = 7

F = 2.437569      Significance Level = 0.01710\*\*

\*Significant at  $\alpha$  less than 0.001 level

\*\*Significant at  $\alpha$  less than 0.05 level

Table 18 indicates that there are significant differences in the ability of the camouflage uniforms to blend with the desert background. The Bartlett's Test indicates that the variance for each uniform is not homogeneous, i.e., significantly different, so they are not necessarily from the same population.



**Figure 15. Camouflage Desert Uniform Ability to Blend with the Desert Background, Means, and 95-Percent Confidence Intervals (Site 6)**

**Table 19**  
**Individual Comparisons Identifying Which Camouflage Uniforms**  
**Differed Significantly from Each Other in the Ability**  
**to Blend with the Desert Background (Site 6)**

Uniforms	Uniform Comparison	Sum of Squares	F	Significance Level
#1 & #4	-3.54545	69.13636	30.915	0.00000***
#1 & #5	-3.36364	62.22727	27.825	0.00000***
#1 & #6	-2.36364	30.72727	13.740	0.00028***
#1 & #8	-2.81818	43.68182	19.533	0.00002***
#1 & #9	0.18182	0.18182	0.081	1.00000
#1 & #10	-4.00000	88.00000	39.350	0.00000***
#1 & #11	-2.27273	28.40909	12.703	0.00047***
#4 & #5	0.18182	0.18182	0.081	1.00000
#4 & #6	1.18182	7.68182	3.435	0.06548
#4 & #8	0.72727	2.90909	1.301	0.25559
#4 & #9	3.72727	76.40909	34.167	0.00000***
#4 & #10	-0.45455	1.63636	0.508	0.47688
#4 & #11	1.27273	8.90909	3.984	0.04746*
#5 & #6	1.00000	5.50000	2.459	0.11859
#5 & #8	0.54545	1.63636	0.732	0.39347
#5 & #9	3.54545	69.13636	30.915	0.00000***
#5 & #10	-0.63636	2.22727	0.996	0.31964
#5 & #11	1.09091	6.54545	2.927	0.08885
#6 & #8	-0.45455	1.13636	0.508	0.47688
#6 & #9	2.54545	35.63636	15.935	0.00010***
#6 & #10	-1.63636	14.72727	6.585	0.00010*
#6 & #11	0.09091	0.04545	0.020	1.00000
#8 & #9	3.00000	49.50000	22.134	0.00001***
#8 & #10	-1.18182	7.68182	3.435	0.06548
#8 & #11	0.54545	1.63636	0.732	0.39347
#9 & #10	-4.18182	96.18182	43.008	0.00000***
#9 & #11	-2.45455	33.13636	14.817	0.00016***
#10 & #11	1.72730	16.40911	5.2471	0.04496*

The following camouflage desert uniforms differed significantly from each other in their ability to blend with the background: 1 vs. 4, 1 vs. 5, 1 vs. 6, 1 vs. 8, 1 vs. 10, 1 vs. 11, 4 vs. 9, 4 vs. 11, 5 vs. 9, 6 vs. 9, 6 vs. 10, 6 vs. 11, 8 vs. 10, 9 vs. 11, and 10 vs. 11.

\*Significant at  $\alpha$  less than 0.05 level

\*\*Significant at  $\alpha$  less than 0.01 level

\*\*\*Significant at  $\alpha$  less than 0.001 level

### 3.1.7 Site Seven--Day

**Table 20**  
Mean Preference Rating for Desert Background Blend  
and 95-Percent Confidence Intervals (Site 7)

Uniform	N	Mean	Standard Error	95% Confidence Interval	
				Lower Limit	Upper Limit
1	11	0.8182	0.2960	0.1587	1.4777
4	11	4.7273	0.4283	3.7729	5.6817
5	11	5.1818	0.4828	4.1062	6.2575
6	11	2.0000	0.3568	1.2051	2.7949
8	11	5.2727	0.2371	4.7445	5.8009
9	11	1.0909	0.3426	0.3276	1.8524
10	11	3.7273	0.3042	3.0494	4.4052
11	11	2.6364	0.5270	1.4622	3.8105

**Table 21**  
Analysis of Variance for the Ability of the Camouflage  
Uniforms to Blend with the Desert Background (Site 7)

Source	Degrees of Freedom	Sum of Squares	Mean Square	F-Test	Level
Uniforms	7	249.8182	35.6883	22.0856	0.0000*
Error	80	129.2727	1.6159		
Total	87	379.0909			

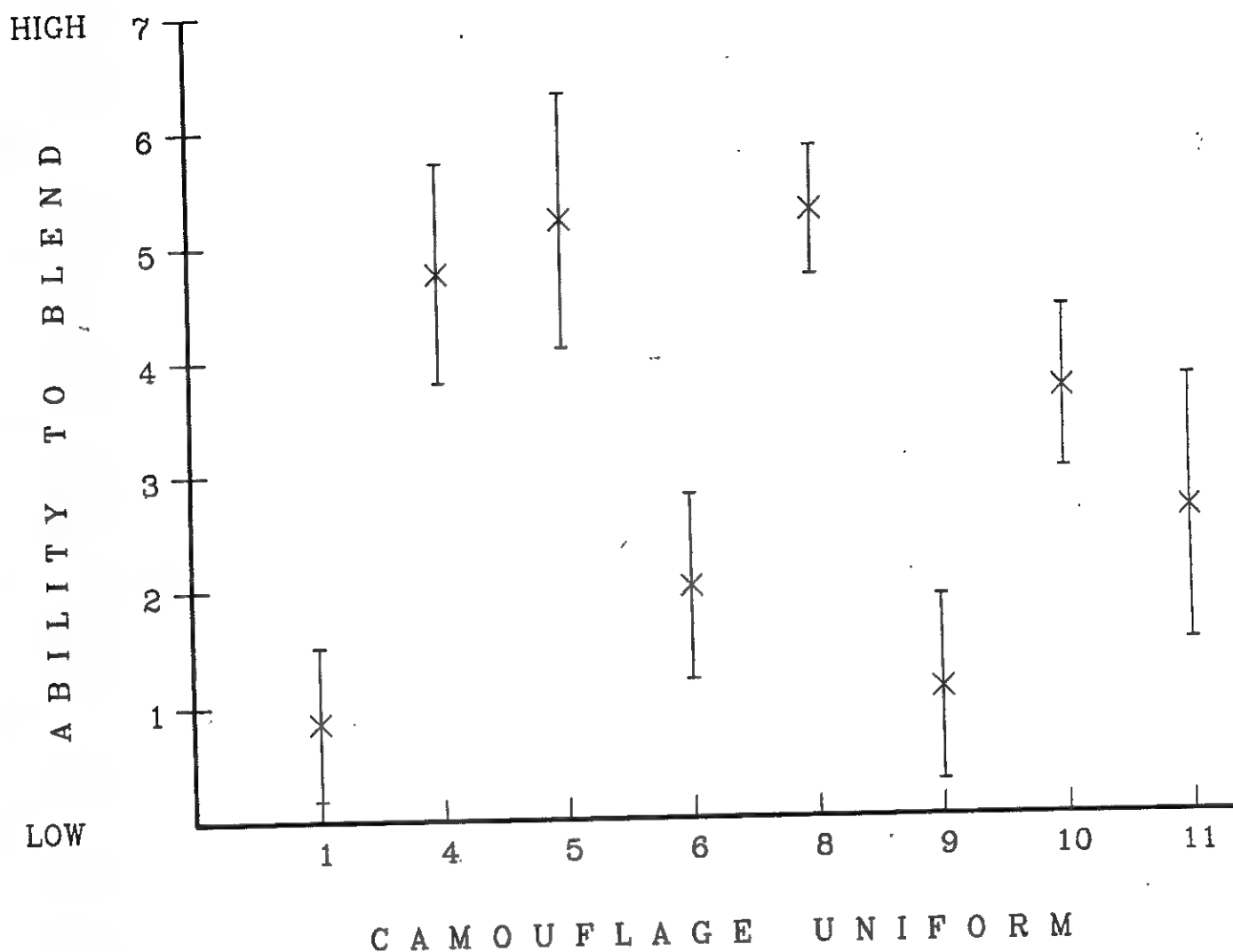
#### Bartlett's Test for Homogeneous Variances

Number Degrees of Freedom = 7

F = 1.35972      Significance Level = 0.21778

\*Significant at  $\alpha$  less than 0.001 level

Table 21 indicates that there are significant differences in the ability of the camouflage uniforms to blend with the desert background. The Bartlett's Test is not significant, so it is concluded that the levels of camouflage uniforms are from the same population.



**Figure 16. Camouflage Desert Uniform Ability to Blend with the Desert Background, Means, and 95-Percent Confidence Intervals (Site 7)**

**Table 22**  
**Individual Comparisons Identifying Which Camouflage Uniforms**  
**Differed Significantly from Each Other in the Ability**  
**to Blend with the Desert Background (Site 7)**

Uniforms	Uniform Comparison	Sum of Squares	F	Significance Level
#1 & #4	-3.90909	84.04545	52.011	0.00000***
#1 & #5	-4.36364	104.72727	64.810	0.00000***
#1 & #6	-1.18182	7.68182	4.754	0.03104*
#1 & #8	-4.45455	109.13636	67.539	0.00000***
#1 & #9	-0.27273	0.40909	0.253	0.61571
#1 & #10	-2.90909	46.54545	28.805	0.00000***
#1 & #11	-1.81818	18.18182	11.252	0.00104**
#4 & #5	-0.45455	1.13636	0.703	0.40325
#4 & #6	2.72727	40.90909	25.316	0.00000***
#4 & #8	-0.54545	1.63636	1.013	0.31615
#4 & #9	3.63636	72.72727	45.007	0.00000***
#4 & #10	1.00000	5.50000	3.404	0.06734
#4 & #11	2.09091	24.04545	14.880	0.00018***
#5 & #6	3.18182	55.68182	34.459	0.00000***
#5 & #8	-0.09091	0.04545	0.028	1.00000
#5 & #9	4.09091	92.04545	56.962	0.00000***
#5 & #10	1.45455	11.63636	7.201	0.00824**
#5 & #11	2.54545	35.63636	22.053	0.00001***
#6 & #8	-3.27273	58.90909	36.456	0.00000***
#6 & #9	0.90909	4.54545	2.813	0.09592
#6 & #10	-1.72727	16.40909	10.155	0.00180**
#6 & #11	-0.63636	2.22727	1.378	0.24254
#8 & #9	4.18182	96.18182	59.522	0.00000***
#8 & #10	1.54545	13.13636	8.129	0.00507**
#8 & #11	2.63636	38.22727	23.657	0.00000***
#9 & #10	-2.63636	38.22727	23.657	0.00000***
#9 & #11	-1.54545	13.13636	8.129	0.00507**
#10 & #11	1.09091	6.54545	4.051	0.04623*

The following camouflage desert uniforms differed significantly from each other in their ability to blend with the background: 1 vs. 4, 1 vs. 5, 1 vs. 6, 1 vs. 8, 1 vs. 10, 1 vs. 11, 4 vs. 6, 4 vs. 9, 4 vs. 11, 5 vs. 6, 5 vs. 9, 5 vs. 10, 5 vs. 11, 6 vs. 8, 6 vs. 10, 8 vs. 9, 8 vs. 10, 8 vs. 11, 9 vs. 10, 9 vs. 11, and 10 vs. 11.

\*Significant at  $\alpha$  less than 0.05 level

\*\*Significant at  $\alpha$  less than 0.01 level

\*\*\*Significant at  $\alpha$  less than 0.001 level

### 3.1.8 Site Eight--Day

**Table 23**  
**Mean Preference Rating for Desert Background Blend**  
**and 95-Percent Confidence Intervals (Site 8)**

Uniform	N	Mean	Standard Error	95% Confidence Interval	
				Lower Limit	Upper Limit
1	11	0.5455	0.2073	0.0836	1.0074
4	11	4.5455	0.3402	3.7876	5.3034
5	11	5.2727	0.2371	4.7445	5.8009
6	11	2.1818	0.2960	1.5223	2.8413
8	11	5.6364	0.2033	5.1834	6.0893
9	11	1.0919	0.3149	0.3892	1.7926
10	11	3.6364	0.3377	2.8839	4.3888
11	11	2.5455	0.6085	1.1897	3.9012

**Table 24**  
**Analysis of Variance for the Ability of the Camouflage**  
**Uniforms to Blend with the Desert Background (Site 8)**

Source	Degrees of Freedom	Sum of Squares	Mean Square	F-Test	Level
Uniforms	7	277.0909	39.5844	31.0466	0.0000*
Error	80	102.0000	1.2750		
Total	87	379.0909			

#### **Bartlett's Test for Homogeneous Variances**

Number Degrees of Freedom = 7

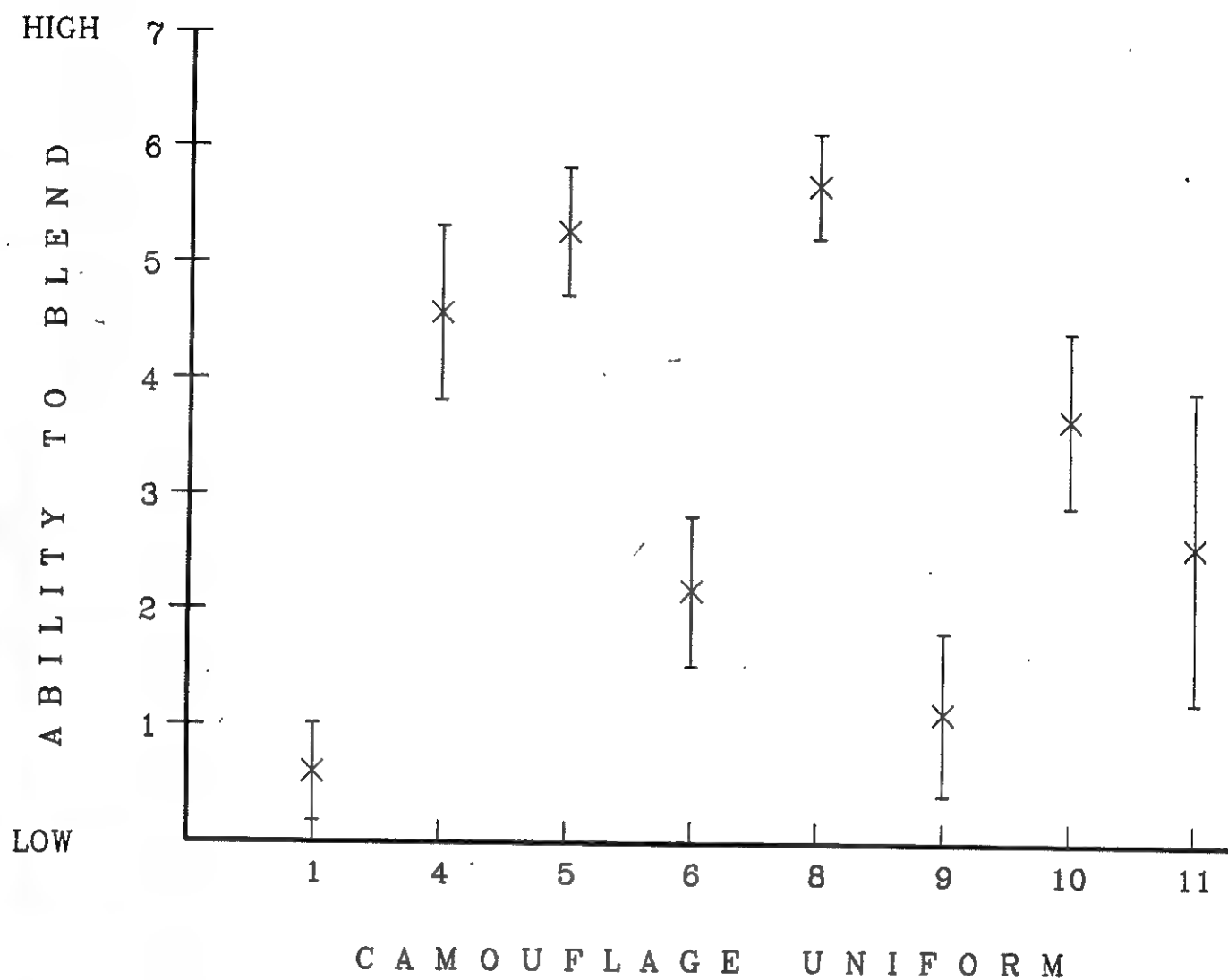
F = 2.814579      Significance Level = 0.00631\*\*

\*Significant at  $\alpha$  less than 0.001 level

\*\*Significant at  $\alpha$  less than 0.01 level

Table 24 indicates that there are significant differences in the ability of the camouflage uniforms to blend with the desert background. The Bartlett's Test indicates that the variance for each uniform is not homogeneous, i.e., significantly different, so they are not necessarily from the same population.





**Figure 17. Camouflage Desert Uniform Ability to Blend with the Desert Background, Means, and 95-Percent Confidence Intervals (Site 8)**

**Table 25**  
**Individual Comparisons Identifying Which Camouflage Uniforms**  
**Differed Significantly from Each Other in the Ability**  
**to Blend with the Desert Background (Site 8)**

Uniforms	Uniform Comparison	Sum of Squares	F	Significance Level
#1 & #4	-4.00000	88.00000	69.020	0.00000***
#1 & #5	-4.72727	122.90909	96.399	0.00000***
#1 & #6	-1.63636	14.72727	11.551	0.00097***
#1 & #8	-5.09091	142.54545	111.800	0.00000***
#1 & #9	-0.54545	1.63636	1.283	0.25992
#1 & #10	-3.09091	52.54545	41.212	0.00000***
#1 & #11	-2.00000	22.00000	17.255	0.00007***
#4 & #5	-0.72727	2.90909	2.282	0.13401
#4 & #6	2.36364	30.72727	24.100	0.00000***
#4 & #8	-1.09091	6.54545	5.134	0.02558*
#4 & #9	3.45455	65.63636	51.480	0.00000***
#4 & #10	0.90909	4.54545	3.565	0.06185
#4 & #11	2.00000	22.00000	17.255	0.00001***
#5 & #6	3.09091	52.54545	41.212	0.00000***
#5 & #8	-0.36364	0.72727	0.570	0.45184
#5 & #9	4.18182	96.18182	75.437	0.00000***
#5 & #10	1.63636	14.72727	11.551	0.00097***
#5 & #11	2.72727	40.90909	32.086	0.00000***
#6 & #8	-3.45455	65.63636	51.480	0.00000***
#6 & #9	1.09091	6.54545	5.134	0.02558*
#6 & #10	-1.45455	11.63636	9.127	0.00318**
#6 & #11	-0.36364	0.72727	0.570	0.45184
#8 & #9	4.54545	113.63636	89.127	0.00000***
#8 & #10	2.00000	22.00000	17.255	0.00007***
#8 & #11	3.09091	52.54545	41.212	0.00000***
#9 & #10	-2.54545	35.63636	27.950	0.00000***
#9 & #11	-1.45455	11.63636	9.127	0.00318**
#10 & #11	1.09091	6.54545	5.134	0.02558*

The following camouflage desert uniforms differed significantly from each other in their ability to blend with the background: 1 vs. 4, 1 vs. 5, 1 vs. 6, 1 vs. 8, 1 vs. 10, 1 vs. 11, 4 vs. 6, 4 vs. 8, 4 vs. 9, 4 vs. 11, 5 vs. 6, 5 vs. 9, 5 vs. 10, 5 vs. 11, 6 vs. 8, 6 vs. 9, 6 vs. 10, 8 vs. 9, 8 vs. 10, 8 vs. 11, 9 vs. 10, 9 vs. 11, and 10 vs. 11.

\*Significant at  $\alpha$  less than 0.05 level

\*\*Significant at  $\alpha$  less than 0.01 level

\*\*\*Significant at  $\alpha$  less than 0.001 level

### 3.1.9 Site Nine--Day

**Table 26**  
**Mean Preference Rating for Desert Background Blend**  
**and 95-Percent Confidence Intervals (Site 9)**

Uniform	N	Mean	Standard Error	95% Confidence Interval	
				Lower Limit	Upper Limit
1	11	1.1818	0.2960	0.5223	1.8413
4	11	5.0909	0.2506	4.5325	5.6493
5	11	5.0909	0.3682	4.2706	5.9112
6	11	2.0000	0.6325	0.5908	3.4092
8	11	5.0909	0.2846	4.4568	5.7250
9	11	0.7273	0.1950	0.2928	1.1617
10	11	3.0909	0.2506	2.5325	3.6493
11	11	3.1818	0.5012	2.0650	4.2986

**Table 27**  
**Analysis of Variance for the Ability of the Camouflage**  
**Uniforms to Blend with the Desert Background (Site 9)**

Source	Degrees of Freedom	Sum of Squares	Mean Square	F-Test	Level
Uniforms	7	246.0000	35.1429	22.8403	0.0000*
Error	80	123.0909	1.5386		
Total	87	369.0909			

**Bartlett's Test for Homogeneous Variances**

Number Degrees of Freedom = 7

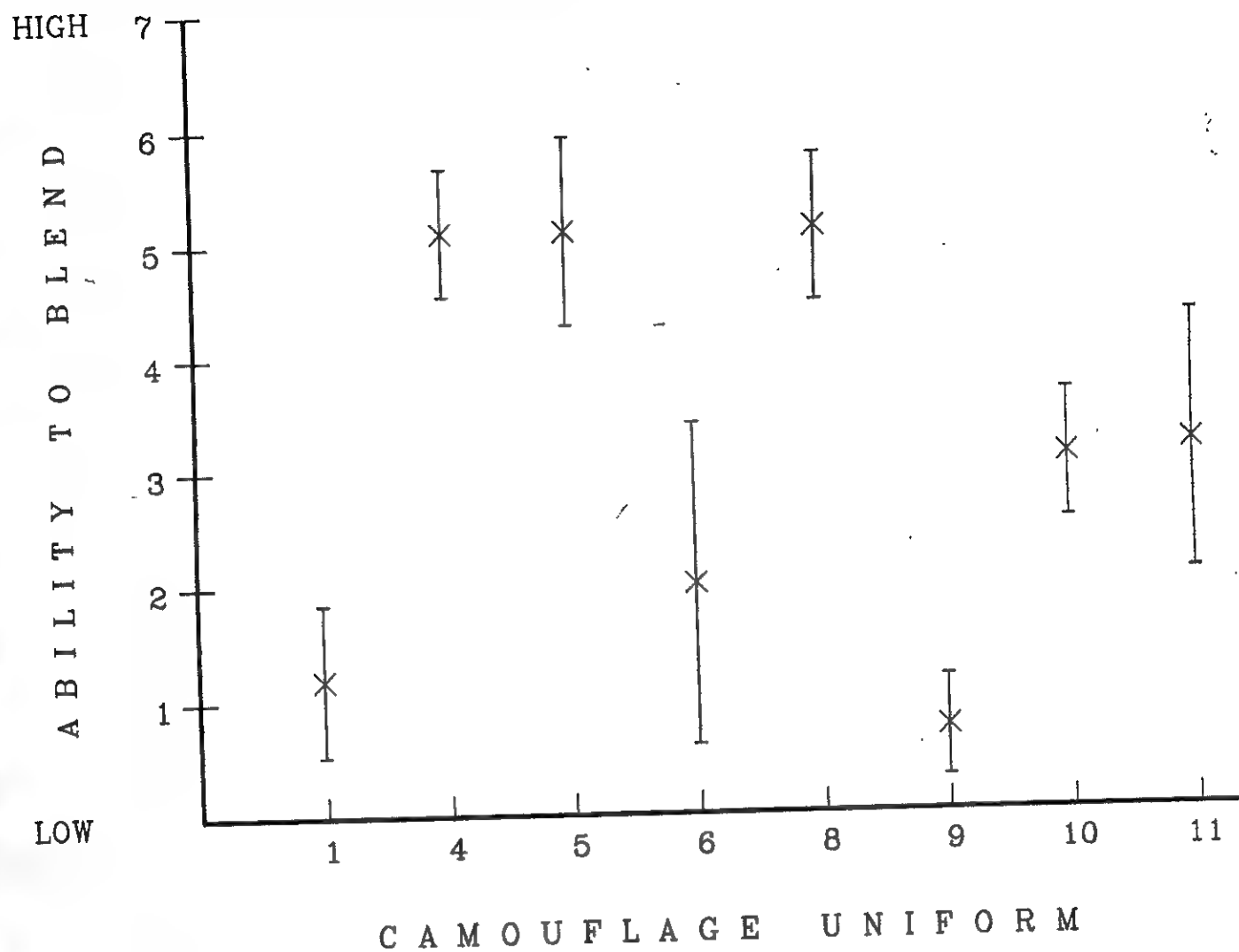
F = 3.19323

Significance Level = 0.00223\*\*

\*Significant at  $\alpha$  less than 0.001 level

\*\*Significant at  $\alpha$  less than 0.01 level

Table 27 indicates that there are significant differences in the ability of the camouflage uniforms to blend with the desert background. The Bartlett's Test indicates that the variance for each uniform is not homogeneous, i.e., significantly different, so they are not necessarily from the same population.



**Figure 18. Camouflage Desert Uniform Ability to Blend with the Desert Background, Means, and 95-Percent Confidence Intervals (Site 9)**

**Table 28**  
**Individual Comparisons Identifying Which Camouflage Uniforms**  
**Differed Significantly from Each Other in the Ability**  
**to Blend with the Desert Background (Site 9)**

Uniforms	Uniform Comparison	Sum of Squares	F	Significance Level
#1 & #4	-3.90909	84.04545	54.623	0.00000***
#1 & #5	-3.90909	84.04545	54.623	0.00000***
#1 & #6	-0.81818	3.68182	2.393	0.12445
#1 & #8	-3.90909	84.04545	54.623	0.00000***
#1 & #9	0.45455	1.13636	0.739	0.39180
#1 & #10	-1.90909	20.04545	13.028	0.00044***
#1 & #11	-2.00000	22.00000	14.298	0.00024***
#4 & #5	0.00000	0.00000	0.000	1.00000
#4 & #6	3.09091	52.54545	34.151	0.00000***
#4 & #8	0.00000	0.00000	0.000	1.00000
#4 & #9	4.36364	104.72727	68.065	0.00000***
#4 & #10	2.00000	22.00000	14.298	0.00024***
#4 & #11	1.90909	20.04545	13.028	0.00044***
#5 & #6	3.09091	52.54545	34.151	0.00000***
#5 & #8	0.00000	0.00000	0.000	1.00000
#5 & #9	4.36364	104.72727	68.065	0.00000***
#5 & #10	2.00000	22.00000	14.298	0.00024***
#5 & #11	1.90909	20.04545	13.028	0.00044***
#6 & #8	-3.09091	52.54545	34.151	0.00000***
#6 & #9	1.27273	8.90909	5.790	0.01760*
#6 & #10	-1.09091	6.54545	4.254	0.04126*
#6 & #11	-1.18182	7.68182	4.993	0.02726*
#8 & #9	4.36364	104.72727	68.065	0.00000***
#8 & #10	2.00000	22.00000	14.298	0.00024***
#8 & #11	1.90909	20.04545	13.028	0.00044***
#9 & #10	-2.36364	30.72727	19.970	0.00002***
#9 & #11	-2.45455	33.13636	21.536	0.00001***
#10 & #11	-0.09091	0.04545	0.030	1.00000

The following camouflage desert uniforms differed significantly from each other in their ability to blend with the background: 1 vs. 4, 1 vs. 5, 1 vs. 8, 1 vs. 10, 1 vs. 11, 4 vs. 6, 4 vs. 9, 4 vs. 10, 4 vs. 11, 5 vs. 6, 5 vs. 9, 5 vs. 10, 5 vs. 11, 6 vs. 8, 6 vs. 9, 6 vs. 10, 6 vs. 11, 8 vs. 9, 8 vs. 10, 8 vs. 11, 9 vs. 10, and 9 vs. 11.

\*Significant at  $\alpha$  less than 0.05 level

\*\*Significant at  $\alpha$  less than 0.01 level

\*\*\*Significant at  $\alpha$  less than 0.001 level

### 3.1.10 Site Ten--Day

**Table 29**  
**Mean Preference Rating for Desert Background Blend**  
**and 95-Percent Confidence Intervals (Site 10)**

Uniform	N	Mean	Standard Error	95% Confidence Interval	
				Lower Limit	Upper Limit
1	10	0.5000	0.2236	0.0000	1.0058
4	10	3.6000	0.3399	2.8310	4.3690
5	10	4.3000	0.3958	3.4046	5.1954
6	10	3.1000	0.6227	1.6913	4.5087
8	10	3.5000	0.3073	2.8048	4.1952
9	10	0.7000	0.3000	0.0214	1.3716
10	10	4.4000	0.5617	3.1292	5.6708
11	10	5.1000	0.6403	3.6515	6.5485

**Table 30**  
**Analysis of Variance for the Ability of the Camouflage**  
**Uniforms to Blend with the Desert Background (Site 10)**

Source	Degrees of Freedom	Sum of Squares	Mean Square	F-Test	Level
Uniforms	7	200.4000	28.6286	14.1376	0.0000*
Error	72	145.8000	2.0250		
Total	79	346.2000			

**Bartlett's Test for Homogeneous Variances**

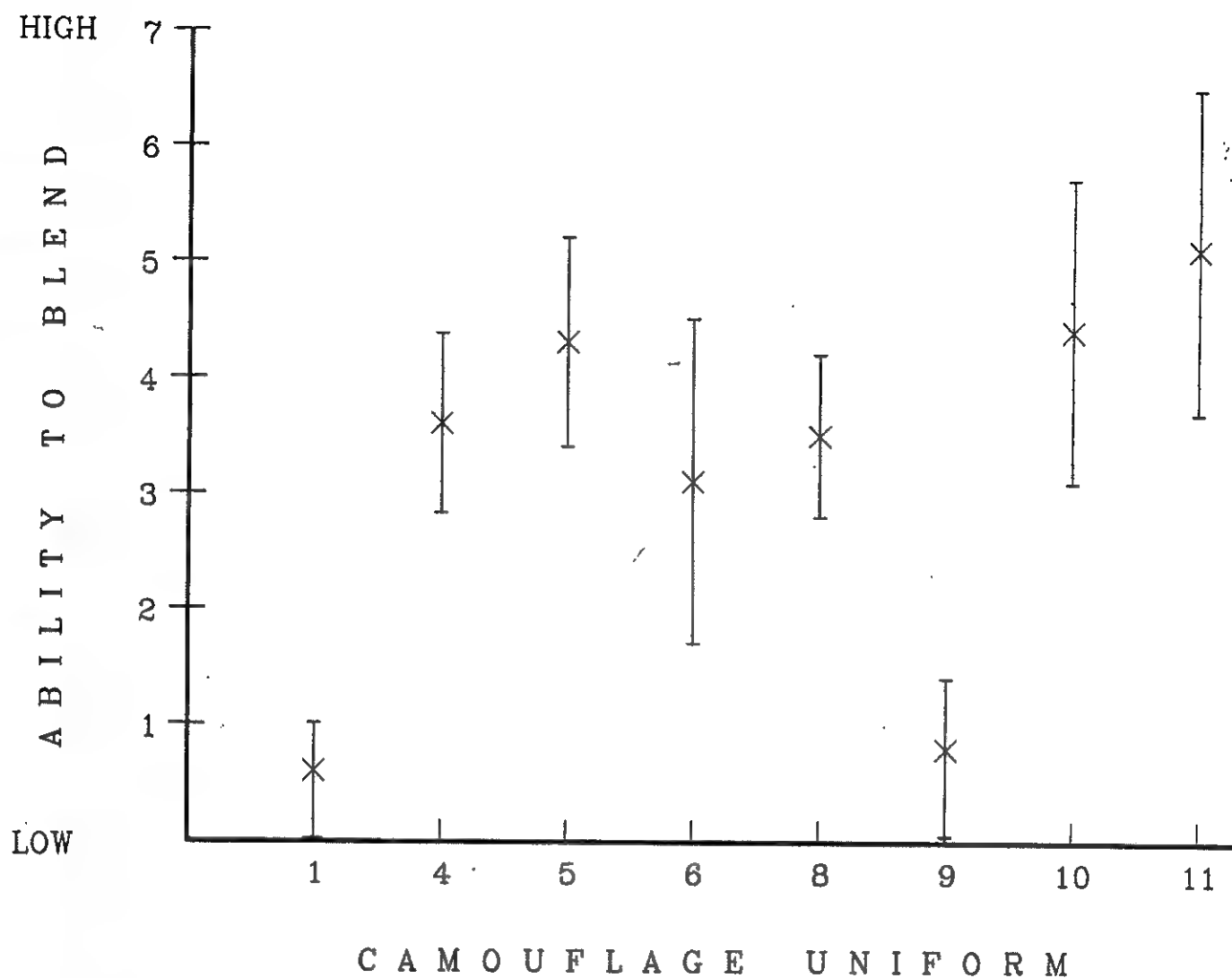
Number Degrees of Freedom = 7

F = 2.462689      Significance Level = 0.01604\*\*

\*Significant at  $\alpha$  less than 0.001 level

\*\*Significant at  $\alpha$  less than 0.05 level

Table 30 indicates that there are significant differences in the ability of the camouflage uniforms to blend with the desert background. The Bartlett's Test indicates that the variance for each uniform is not homogeneous, i.e., significantly different, so they are not necessarily from the same population.



Two manual  
horizontal write-  
ups near x-axis  
(his note goes  
on Fig 19 original)

**Figure 19. Camouflage Desert Uniform Ability to Blend with the Desert Background, Means, and 95-Percent Confidence Intervals (Site 10)**

**Table 31**  
**Individual Comparisons Identifying Which Camouflage Uniforms**  
**Differed Significantly from Each Other in the Ability**  
**to Blend with the Desert Background (Site 10)**

Uniforms	Uniform Comparison	Sum of Squares	F	Significance Level
#1 & #4	-3.10000	48.05000	23.728	0.00000***
#1 & #5	-3.80000	72.20000	35.654	0.00000***
#1 & #6	-2.60000	33.80000	16.691	0.00007***
#1 & #8	-3.00000	45.00000	22.222	0.00001***
#1 & #9	-0.20000	0.20000	0.099	1.00000
#1 & #10	-3.90000	76.05000	37.556	0.00000***
#1 & #11	-4.60000	105.80000	52.247	0.00000***
#4 & #5	-0.70000	2.45000	1.210	0.27317
#4 & #6	0.50000	1.25000	0.617	0.43333
#4 & #8	0.10000	0.05000	0.025	1.00000
#4 & #9	2.90000	42.05000	20.765	0.00001***
#4 & #10	-0.80000	3.20000	1.580	0.21074
#4 & #11	-1.50000	11.25000	5.556	0.01975*
#5 & #6	1.20000	7.20000	3.556	0.06134
#5 & #8	0.80000	3.20000	1.580	0.21074
#5 & #9	3.60000	64.80000	32.000	0.00000***
#5 & #10	-0.10000	0.05000	0.025	1.00000
#5 & #11	-0.80000	3.20000	1.580	0.21074
#6 & #8	-0.40000	0.80000	0.395	0.53063
#6 & #9	2.40000	28.80000	14.222	0.00024***
#6 & #10	-1.30000	8.45000	4.173	0.04288*
#6 & #11	-2.00000	20.00000	9.877	0.00203**
#8 & #9	2.80000	39.20000	19.358	0.00002***
#8 & #10	-0.90000	4.05000	2.000	0.15943
#8 & #11	-1.60000	12.80000	6.321	0.01302*
#9 & #10	-3.70000	68.45000	33.802	0.00000***
#9 & #11	-4.40000	96.80000	47.802	0.00000***
#10 & #11	-0.70000	2.45000	1.210	0.27317

The following camouflage desert uniforms differed significantly from each other in their ability to blend with the background: 1 vs. 4, 1 vs. 5, 1 vs. 6, 1 vs. 8, 1 vs. 10, 1 vs. 11, 4 vs. 9, 4 vs. 11, 5 vs. 9, 6 vs. 9, 6 vs. 10, 6 vs. 11, 8 vs. 9, 8 vs. 11, 9 vs. 10, and 9 vs. 11.

\*Significant at  $\alpha$  less than 0.05 level

\*\*Significant at  $\alpha$  less than 0.01 level

\*\*\*Significant at  $\alpha$  less than 0.001 level



### 3.1.11 All Sites Combined--Day

**Table 32**  
Mean Preference Rating for Desert Background Blend  
and 95-Percent Confidence Intervals (Across All Sites)

Uniform	N	Mean	Standard Error	95% Confidence Interval	
				Lower Limit	Upper Limit
1	116	0.8190	0.0761	0.6683	0.9696
4	116	4.3966	0.1266	4.1458	4.6473
5	116	4.7845	0.1340	4.5190	5.0500
6	116	2.5345	0.1725	2.1928	2.8761
8	116	4.5000	0.1197	4.2630	4.7370
9	116	0.9397	0.0902	0.7610	1.1184
10	116	3.9655	0.1278	3.7124	4.2187
11	116	3.6466	0.1878	3.2745	4.0186

**Table 33**  
Analysis of Variance for the Ability of the Camouflage  
Uniforms to Blend with the Desert Background (Across All Sites)

Source	Degrees of Freedom	Sum of Squares	Mean Square	F-Test	Level
Uniforms	7	2046.1379	292.3054	140.4009	0.0000*
Error	920	1915.3793	2.0819		
Total	927	3961.5172			

#### Bartlett's Test for Homogeneous Variance

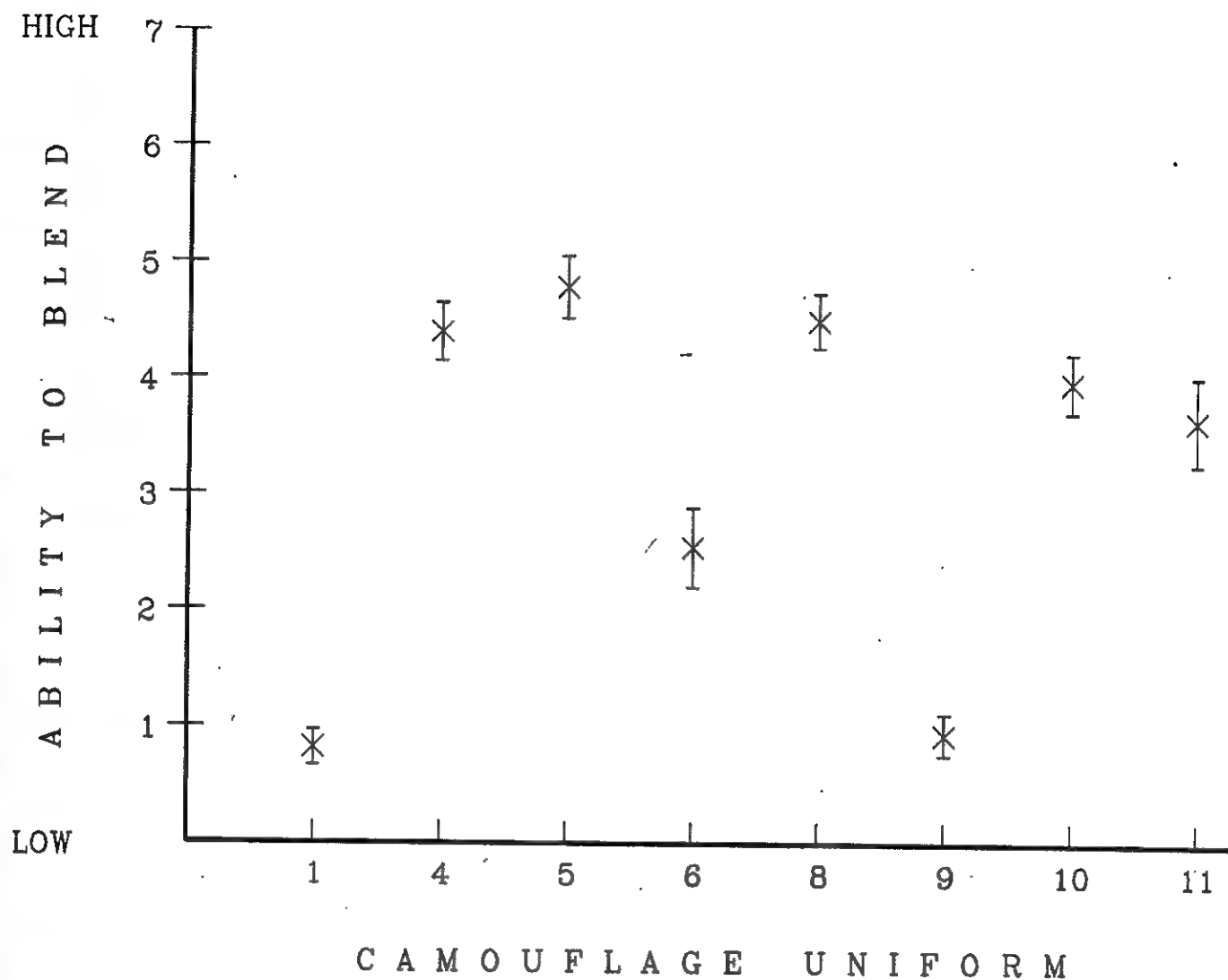
Number Degrees of Freedom = 7

F = 19.23

Significance Level = 0.000\*

\*Significant at  $\alpha$  less than 0.001 level

Table 33 indicates that there are significant differences in the ability of the camouflage uniforms to blend with the desert background. The Bartlett's Test indicates that the variance for each uniform is not homogeneous, i.e., significantly different, so they are not necessarily from the same population.



**Figure 20. Camouflage Desert Uniform Ability to Blend with the Desert Background, Means, and 95-Percent Confidence Intervals (Across All Sites)**

**Table 34**  
**Individual Comparisons Identifying Which Camouflage Uniforms**  
**Differed Significantly from Each Other in the Ability to Blend**  
**with the Desert Background (Across All Sites)**

Uniforms	F value	Significance Level
1 and 4	586.8234	0.0000***
1 and 5	662.1497	0.0000***
1 and 6	82.8156	0.0000***
1 and 8	673.9685	0.0000***
1 and 9	1.0459	0.3075
1 and 10	447.6254	0.0000***
1 and 11	194.7329	0.0000***
4 and 5	4.4280	0.0364*
4 and 6	75.7488	0.0000***
4 and 8	0.3527	0.5532
4 and 9	494.5606	0.0000***
4 and 10	5.7422	0.0174*
4 and 11	10.9660	0.0011**
5 and 6	106.1060	0.0000***
5 and 8	2.5072	0.1147
5 and 9	566.3615	0.0000***
5 and 10	19.5578	0.0000***
5 and 11	24.3252	0.0000***
6 and 8	87.6666	0.0000***
6 and 9	67.1296	0.0000***
6 and 10	44.4402	0.0000***
6 and 11	19.0202	0.0000***
8 and 9	564.4567	0.0000***
8 and 10	9.3207	0.0025**
8 and 11	14.6884	0.0002***
9 and 10	374.1547	0.0000***
9 and 11	268.7936	0.0000***
10 and 11	1.9716	0.1616

The following camouflage desert uniforms differed significantly from each other in their ability to blend with the background: 1 vs. 4, 1 vs. 5, 1 vs. 6, 1 vs. 8, 1 vs. 10, 1 vs. 11, 4 vs. 5, 4 vs. 6, 4 vs. 9, 4 vs. 10, 4 vs. 11, 5 vs. 6, 5 vs. 9, 5 vs. 10, 5 vs. 11, 6 vs. 8, 6 vs. 9, 6 vs. 10, 6 vs. 11, 8 vs. 9, 8 vs. 10, 8 vs. 11, 9 vs. 10, and 9 vs. 11.

\*Significant at  $\alpha$  less than 0.05 level

\*\*Significant at  $\alpha$  less than 0.01 level

\*\*\*Significant at  $\alpha$  less than 0.001 level

### 3.2 Night Observations

The eight desert uniforms shown in Figures 1-8 were evaluated at night for sites 1, 2, 3, 4, 8, and 9 as described in Section 2.4. The mean preference with associated standard error and 95% confidence intervals are shown for each of the above sites (Tables 35, 38, 41, 44, 47, and 50 and Figures 21-26). The higher the mean value, the more preferred the colors were rated by the ground observers as blending with the desert soil background. Table 53 and Figure 27 identify how each uniform was rated as to its ability to blend, when averaged across all six sites. Tables 36, 39, 42, 45, 48, and 57 show the analysis of variance performed to determine if there were significant differences in the ability of the desert camouflage uniforms to blend with the background for each of the six sites. Table 54 shows the analysis of variance performed to determine significant differences for the camouflage uniforms averaged across all the sites. Tables 37, 40, 43, 46, 49, and 52 show the Individual Paired Comparison Tests for the uniforms for each of the six sites to determine which of the mean preferences for the ability of the uniform to blend with the desert differ significantly from each other. Table 55 shows the Paired Comparison Test for the camouflage uniforms averaged across all six sites.

### 3.2.1 Site One--Night

**Table 35**  
**Mean Preference Rating for Desert Background Blend**  
**and 95-Percent Confidence Intervals (Site 1)**

Uniform	N	Mean	Standard Error	95% Confidence Interval	
				Lower Limit	Upper Limit
1	15	0.6667	0.1260	0.3965	0.9368
4	15	3.8000	0.3928	2.9579	4.6421
5	15	3.4000	0.2545	2.8544	3.9456
6	15	5.4000	0.4000	4.5424	6.2576
8	15	3.4667	0.3501	2.7161	4.2172
9	15	1.1333	0.3217	0.4436	1.8231
10	15	5.4667	0.2153	5.0051	5.9282
11	15	2.8000	0.4598	1.8142	3.7858

**Table 36**  
**Analysis of Variance for the Ability of the Camouflage**  
**Uniforms to Blend with the Desert Background (Site 1)**

Source	Degrees of Freedom	Sum of Squares	Mean Square	F-Test	Level
Uniforms	7	318.9333	45.5619	27.6532	0.000*
Error	112	184.5333	1.6476		
Total	119	503.4667			

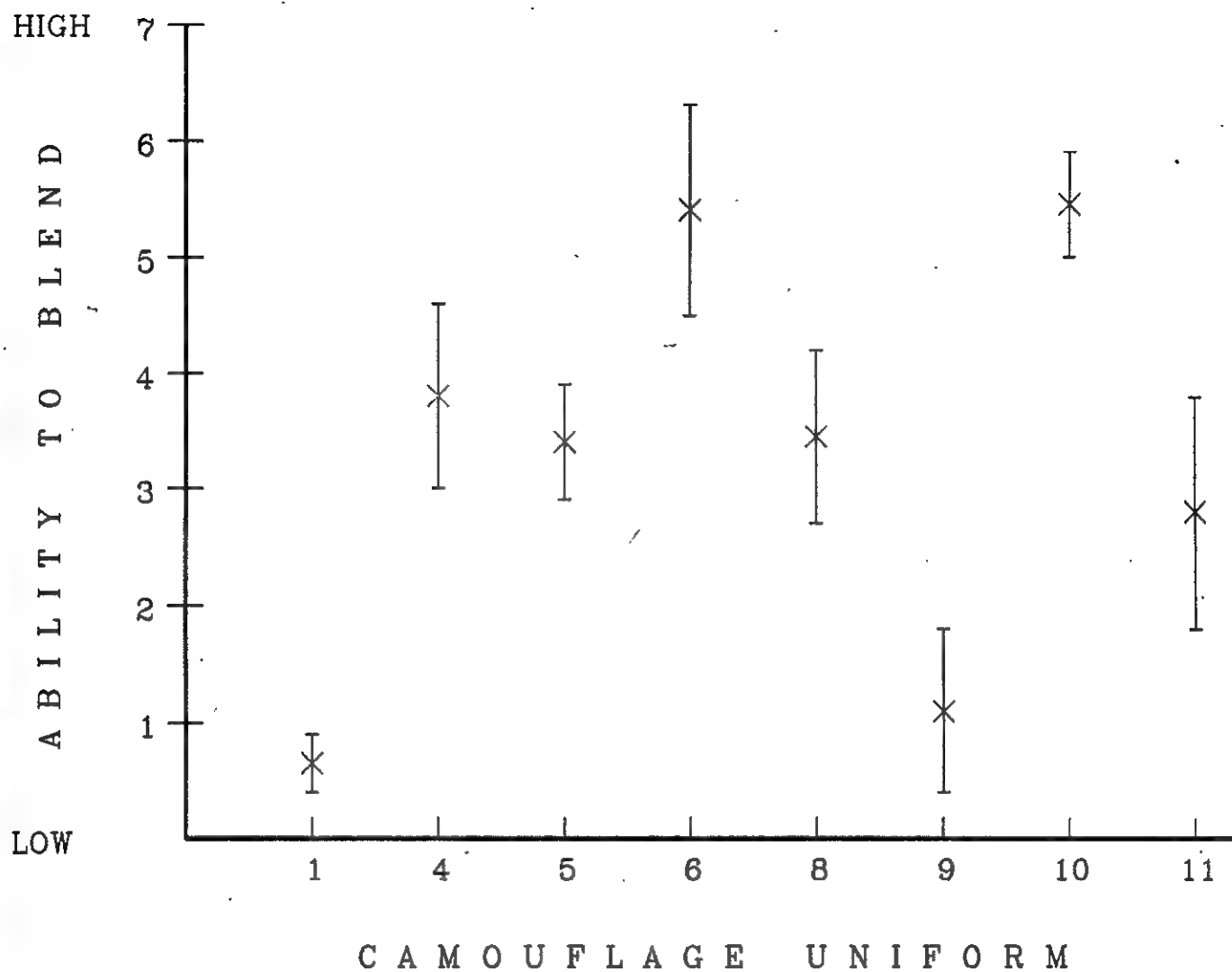
#### **Bartlett's Test for Homogeneous Variances**

Number Degrees of Freedom = 7

F = 3.71615      Significance Level = 0.00051\*\*

\*Significant at  $\alpha$  less than 0.001 level

Table 35 indicates that there are significant differences in the ability of the camouflage uniforms to blend with the desert background. The Bartlett's Test indicates that the variance for each uniform is not homogeneous, i.e., significantly different, so they are not necessarily from the same population.



**Figure 21. Camouflage Desert Uniform Ability to Blend with the Desert Background, Means, and 95-Percent Confidence Intervals (Site 1)**

**Table 37**  
**Individual Comparisons Identifying Which Camouflage Uniforms**  
**Differed Significantly from Each Other in the Ability**  
**to Blend with the Desert Background (Site 1)**

Uniforms	Uniform Comparison	Sum of Squares	F	Significance Level
#1 & #4	-3.13333	73.63333	44.691	0.00000***
#1 & #5	-2.73333	56.03333	34.009	0.00000***
#1 & #6	-4.73333	168.03333	101.986	0.00000***
#1 & #8	-2.80000	58.80000	35.688	0.00000***
#1 & #9	-0.46667	1.63333	0.991	0.32072
#1 & #10	-4.80000	172.80000	104.879	0.00000***
#1 & #11	-2.13333	34.13333	20.717	0.00001***
#4 & #5	0.40000	1.20000	0.728	0.39453
#4 & #6	-1.60000	19.20000	11.653	0.00079***
#4 & #8	0.33333	0.83333	0.506	0.47787
#4 & #9	2.66667	53.33333	32.370	0.00000***
#4 & #10	-1.66667	20.83333	12.645	0.00048***
#4 & #11	1.00000	7.50000	4.552	0.03420*
#5 & #6	-2.00000	30.00000	18.208	0.00003***
#5 & #8	-0.06667	0.03333	0.020	1.00000
#5 & #9	2.26667	38.53333	23.387	0.00000***
#5 & #10	-2.06667	32.03333	19.442	0.00002***
#5 & #11	0.60000	2.70000	1.639	0.20211
#6 & #8	1.93333	28.03333	17.014	0.00006***
#6 & #9	4.26667	136.53333	82.867	0.00000***
#6 & #10	-0.06667	0.03333	0.020	1.00000
#6 & #11	2.60000	50.70000	30.772	0.00000***
#8 & #9	2.33333	40.83333	24.783	0.00000***
#8 & #10	-2.00000	30.00000	18.208	0.00003***
#8 & #11	0.66667	3.33333	2.023	0.15661
#9 & #10	-4.33333	140.83333	85.477	0.00000***
#9 & #11	-1.66667	20.83333	12.645	0.00048***
#10 & #11	2.66667	53.33333	32.370	0.00000***

The following camouflage desert uniforms differed significantly from each other in their ability to blend with the background: 1 vs. 4, 1 vs. 5, 1 vs. 6, 1 vs. 8, 1 vs. 10, 1 vs. 11, 4 vs. 6, 4 vs. 9, 4 vs. 10, 4 vs. 11, 5 vs. 6, 5 vs. 9, 5 vs. 10, 6 vs. 8, 6 vs. 9, 8 vs. 9, 8 vs. 10, 8 vs. 11, 9 vs. 10, 9 vs. 11, and 10 vs. 11.

\*Significant at  $\alpha$  less than 0.05 level

\*\*Significant at  $\alpha$  less than 0.01 level

\*\*\*Significant at  $\alpha$  less than 0.001 level

### 3.2.2 Site Two--Night

**Table 38**  
Mean Preference Rating for Desert Background Blend  
and 95-Percent Confidence Intervals (Site 2)

Uniform	N	Mean	Standard Error	95% Confidence Interval	
				Lower Limit	Upper Limit
1	15	0.5333	0.1333	0.2475	0.8192
4	15	4.2000	0.2430	3.6790	4.7210
5	15	4.2000	0.3409	3.4692	4.9308
6	15	5.8667	0.3065	5.2094	6.5239
8	15	3.0000	0.2760	2.4082	3.5918
9	15	0.6667	0.1869	0.2660	1.0673
10	15	4.6667	0.3333	3.9520	5.3813
11	15	3.0000	0.4024	2.1373	3.8627

**Table 39**  
Analysis of Variance for the Ability of the Camouflage  
Uniforms to Blend with the Desert Background (Site 2)

Source	Degrees of Freedom	Sum of Squares	Mean Square	F-Test	Level
Uniforms	7	372.5333	53.2190	42.2933	0.000*
Error	112	140.9333	1.2503		
Total	119	513.4667			

#### Bartlett's Test for Homogeneous Variances

Number Degrees of Freedom = 7

F = 2.92022

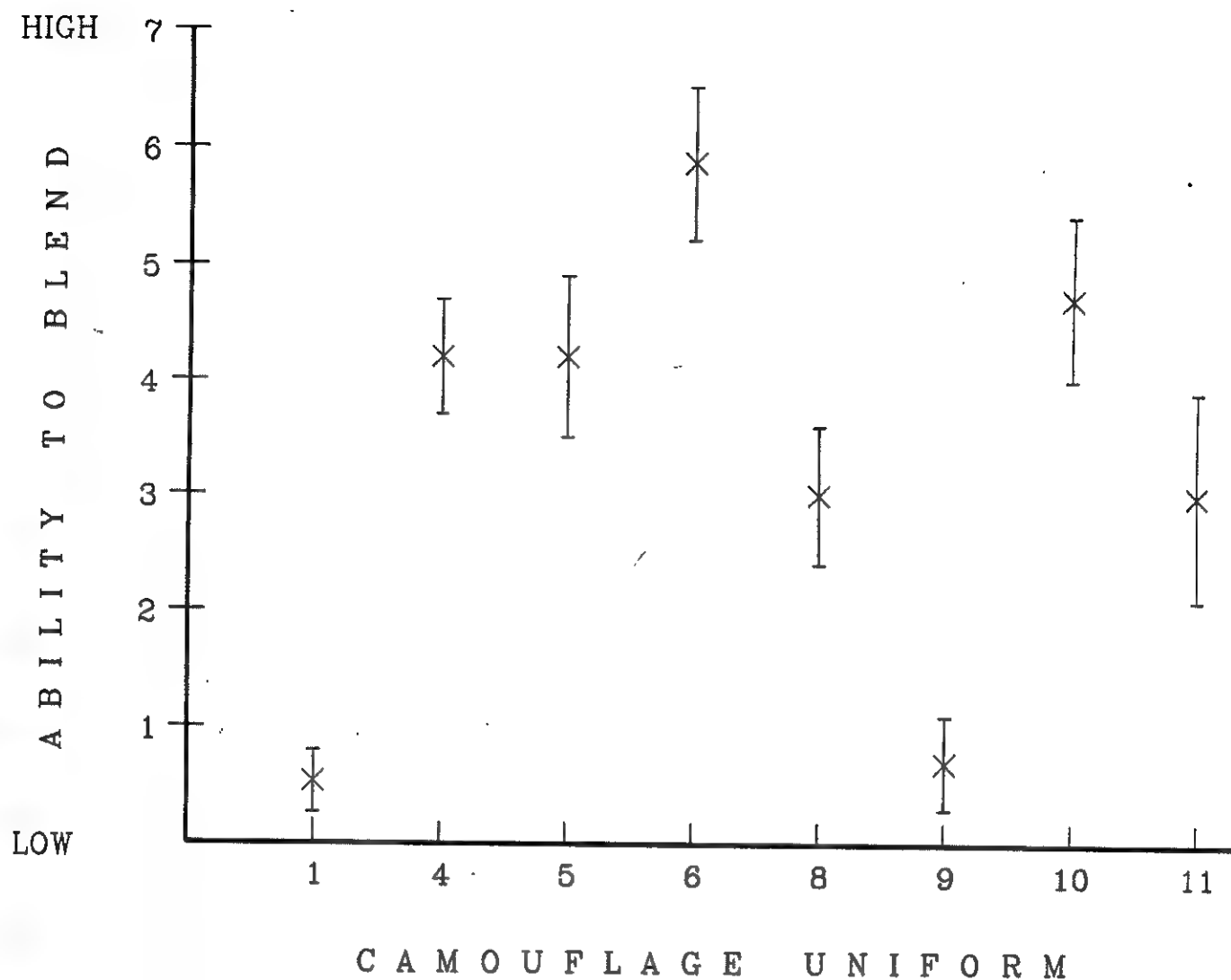
Significance Level = 0.00471\*\*

\*Significant at  $\alpha$  less than 0.001 level

\*\*Significant at  $\alpha$  less than 0.01 level

Table 39 indicates that there are significant differences in the ability of the camouflage uniforms to blend with the desert background. The Bartlett's Test indicates that the variance for each uniform is not homogeneous, i.e., significantly different, so they are not necessarily from the same population.





**Figure 22. Camouflage Desert Uniform Ability to Blend with the Desert Background, Means, and 95-Percent Confidence Intervals (Site 2)**

**Table 40**  
**Individual Comparisons Identifying Which Camouflage Uniforms**  
**Differed Significantly from Each Other in the Ability**  
**to Blend with the Desert Background (Site 2)**

Uniforms	Uniform Comparison	Sum of Squares	F	Significance Level
#1 & #4	-3.66667	100.83333	80.132	0.00000***
#1 & #5	-3.66667	100.83333	80.132	0.00000***
#1 & #6	-5.33333	213.33333	169.536	0.00000***
#1 & #8	-2.46667	45.63333	36.265	0.00000***
#1 & #9	-0.13333	0.13333	0.106	1.00000
#1 & #10	-4.13333	128.13333	101.828	0.00000***
#1 & #11	-2.46667	45.63333	36.265	0.00000***
#4 & #5	0.00000	0.00000	0.000	1.00000
#4 & #6	-1.66667	20.83333	16.556	0.00008***
#4 & #8	1.20000	10.80000	8.583	0.00396**
#4 & #9	3.53333	93.63333	74.411	0.00000***
#4 & #10	-0.46667	1.63333	1.298	0.25651
#4 & #11	1.20000	10.80000	8.583	0.00396**
#5 & #6	-1.66667	20.83333	16.556	0.00008***
#5 & #8	1.20000	10.80000	8.583	0.00396**
#5 & #9	3.53333	93.63333	74.411	0.00000***
#5 & #10	-0.46667	1.63333	1.298	0.25651
#5 & #11	1.20000	10.80000	8.583	0.00396**
#6 & #8	2.86667	61.63333	48.980	0.00000***
#6 & #9	5.20000	202.80000	161.166	0.00000***
#6 & #10	1.20000	10.80000	8.583	0.00396**
#6 & #11	2.86667	61.63333	48.980	0.00000***
#8 & #9	2.33333	40.83333	32.450	0.00000***
#8 & #10	-1.66667	20.83333	16.556	0.00008***
#8 & #11	0.00000	0.00000	0.000	1.00000
#9 & #10	-4.00000	120.00000	95.364	0.00000***
#9 & #11	-2.33333	40.83333	32.450	0.00000***
#10 & #11	1.66667	20.83333	16.556	0.00008***

The following camouflage desert uniforms differed significantly from each other in their ability to blend with the background: 1 vs. 4, 1 vs. 5, 1 vs. 6, 1 vs. 8, 1 vs. 10, 1 vs. 11, 4 vs. 6, 4 vs. 8, 4 vs. 9, 4 vs. 11, 5 vs. 6, 5 vs. 8, 5 vs. 9, 5 vs. 11, 6 vs. 8, 6 vs. 9, 6 vs. 10, 6 vs. 11, 8 vs. 9, 8 vs. 10, 9 vs. 10, 9 vs. 11, and 10 vs. 11.

\*Significant at  $\alpha$  less than 0.05 level

\*\*Significant at  $\alpha$  less than 0.01 level

\*\*\*Significant at  $\alpha$  less than 0.001 level

### 3.2.3 Site Three--Night

**Table 41**  
**Mean Preference Rating for Desert Background Blend**  
**and 95-Percent Confidence Intervals (Site 3)**

Uniform	N	Mean	Standard Error	95% Confidence Interval	
				Lower Limit	Upper Limit
1	12	0.6667	0.2562	0.1029	1.2304
4	12	3.6667	0.2843	3.0413	4.2921
5	12	3.2500	0.3718	2.4320	4.0680
6	12	4.5833	0.4516	3.5899	5.5768
8	12	3.8333	0.5882	2.5393	5.1273
9	12	0.8333	0.2072	0.3775	1.2892
10	12	5.1667	0.3860	4.3175	6.0158
11	12	3.6667	0.4820	2.6063	4.7271

**Table 42**  
**Analysis of Variance for the Ability of the Camouflage**  
**Uniforms to Blend with the Desert Background (Site 3)**

Source	Degrees of Freedom	Sum of Squares	Mean Square	F-Test	Level
Uniforms	7	223.6667	31.9524	16.9216	0.000*
Error	88	166.1667	1.8883		
Total	95	389.8334			

#### **Bartlett's Test for Homogeneous Variances**

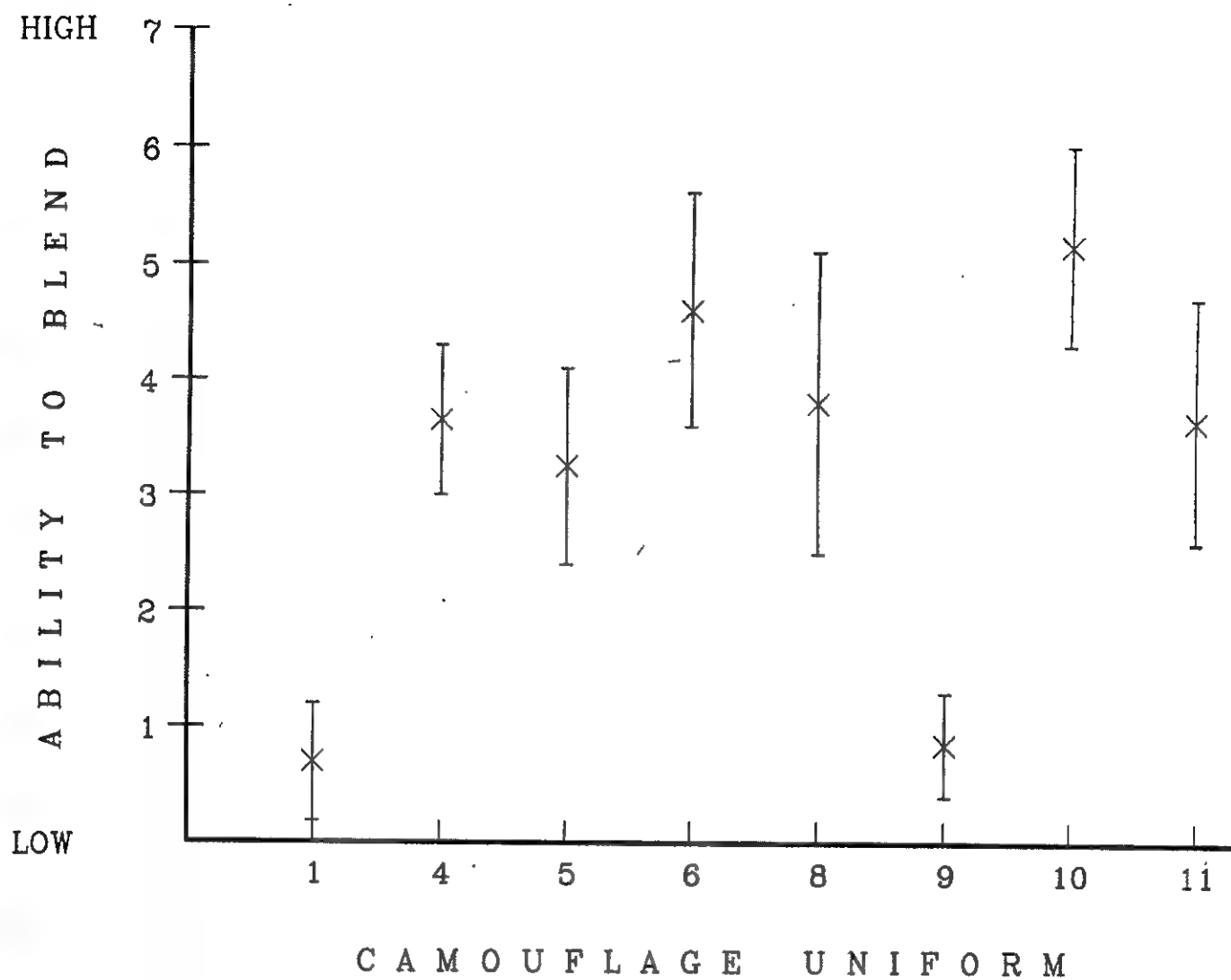
Number Degrees of Freedom = 7

F = 2.41445      Significance Level = 0.02510\*\*

\*Significant at  $\alpha$  less than 0.001 level

\*\*Significant at  $\alpha$  less than 0.05 level

Table 42 indicates that there are significant differences in the ability of the camouflage uniforms to blend with the desert background. The Bartlett's Test indicates that the variance for each uniform is not homogeneous, i.e., significantly different, so they are not necessarily from the same population.



**Figure 23. Camouflage Desert Uniform Ability to Blend with the Desert Background, Means, and 95-Percent Confidence Intervals (Site 3)**

**Table 43**  
**Individual Comparisons Identifying Which Camouflage Uniforms**  
**Differed Significantly from Each Other in the Ability**  
**to Blend with the Desert Background (Site 3)**

Uniforms	Uniform Comparison	Sum of Squares	F	Significance Level
#1 & #4	-3.00000	54.00000	28.598	0.00000***
#1 & #5	-2.58333	40.04167	21.206	0.00001***
#1 & #6	-3.91667	92.04167	48.744	0.00000***
#1 & #8	-3.16667	60.16667	31.864	0.00000***
#1 & #9	-0.16667	0.16667	0.088	1.00000
#1 & #10	-4.50000	121.50000	64.345	0.00000***
#1 & #11	-3.00000	54.00000	28.598	0.00000***
#4 & #5	0.41667	1.04167	0.552	0.45869
#4 & #6	-0.91667	5.04167	2.670	0.10415
#4 & #8	-0.16667	0.16667	0.088	1.00000
#4 & #9	2.83333	48.16667	25.509	0.00000***
#4 & #10	-1.50000	13.50000	7.149	0.00825**
#4 & #11	0.00000	0.00000	0.000	1.00000
#5 & #6	-1.33333	10.66667	5.649	0.01860*
#5 & #8	-0.58333	2.04167	1.081	0.29993
#5 & #9	2.41667	35.04167	18.558	0.00003***
#5 & #10	-1.91667	22.04167	11.673	0.00080***
#5 & #11	-0.41667	1.04167	0.552	0.45869
#6 & #8	0.75000	3.37500	1.787	0.18308
#6 & #9	3.75000	84.37500	44.684	0.00000***
#6 & #10	-0.58333	2.04167	1.081	0.29993
#6 & #11	0.91667	5.04167	2.670	0.10415
#8 & #9	3.00000	54.00000	28.598	0.00000***
#8 & #10	-1.33333	10.66667	5.649	0.01860*
#8 & #11	0.16667	0.16667	0.088	1.00000
#9 & #10	-4.33333	112.66667	59.667	0.00000***
#9 & #11	-2.83333	48.16667	25.509	0.00000***
#10 & #11	1.50000	13.50000	7.149	0.00825**

The following camouflage desert uniforms differed significantly from each other in their ability to blend with the background: 1 vs. 4, 1 vs. 5, 1 vs. 6, 1 vs. 8, 1 vs. 11, 4 vs. 9, 4 vs. 10, 4 vs. 11, 5 vs. 6, 5 vs. 9, 5 vs. 10, 6 vs. 9, 8 vs. 9, 8 vs. 10, 9 vs. 10, 9 vs. 11, and 10 vs. 11.

\*Significant at  $\alpha$  less than 0.05 level

\*\*Significant at  $\alpha$  less than 0.01 level

\*\*\*Significant at  $\alpha$  less than 0.001 level

### 3.2.4 Site Four--Night

**Table 44**  
**Mean Preference Rating for Desert Background Blend**  
**and 95-Percent Confidence Intervals (Site 4)**

Uniform	N	Mean	Standard Error	95% Confidence Interval	
				Lower Limit	Upper Limit
1	11	0.6364	0.2033	0.1837	1.0891
4	11	4.3636	0.3377	3.6116	5.1157
5	11	4.4545	0.3900	3.5861	5.3230
6	11	4.5455	0.6232	3.1575	5.9334
8	11	3.6364	0.5270	2.4628	4.8099
9	11	1.0000	0.3568	0.2055	1.7945
10	11	3.5455	0.2817	2.9182	4.1727
11	11	3.2727	0.5892	1.9607	4.5848

**Table 45**  
**Analysis of Variance for the Ability of the Camouflage**  
**Uniforms to Blend with the Desert Background (Site 4)**

Source	Degrees of Freedom	Sum of Squares	Mean Square	F-Test	Level
Uniforms	7	181.0909	25.8701	12.3191	0.000*
Error	80	168.0000	2.1000		
Total	87	349.0909			

#### Bartlett's Test for Homogeneous Variances

Number Degrees of Freedom = 7

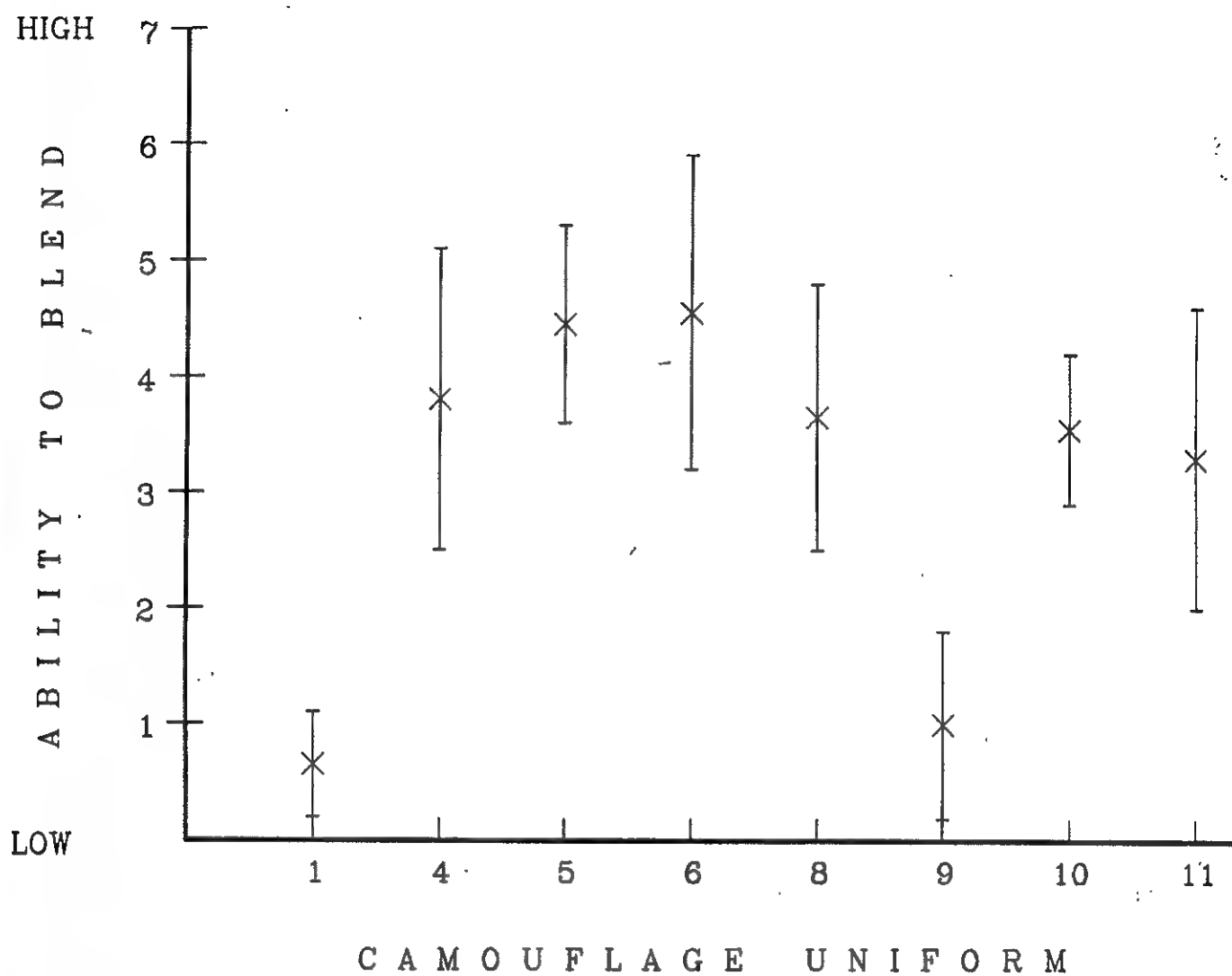
F = 2.58450

Significance Level = 0.01164\*\*

\*Significant at  $\alpha$  less than 0.001 level

\*\*Significant at  $\alpha$  less than 0.05 level

Table 45 indicates that there are significant differences in the ability of the camouflage uniforms to blend with the desert background. The Bartlett's Test indicates that the variance for each uniform is not homogeneous, i.e., significantly different, so they are not necessarily from the same population.



**Figure 24. Camouflage Desert Uniform Ability to Blend with the Desert Background, Means, and 95-Percent Confidence Intervals (Site 4)**

### 3.2.5 Site Eight--Night

**Table 47**  
Mean Preference Rating for Desert Background Blend  
and 95-Percent Confidence Intervals (Site 8)

Uniform	N	Mean	Standard Error	95% Confidence Interval	
				Lower Limit	Upper Limit
1	11	2.0000	0.4264	1.0504	2.9496
4	11	5.0000	0.2697	4.3994	5.6006
5	11	4.9091	0.3149	4.2078	5.6104
6	11	1.9091	0.6098	0.5510	3.2672
8	11	4.6364	0.5439	3.4250	5.8477
9	11	1.5455	0.3123	0.8500	2.2409
10	11	3.6364	0.3878	2.7727	4.5001
11	11	1.8182	0.5692	0.5506	3.0857

**Table 48**  
Analysis of Variance for the Ability of the Camouflage  
Uniforms to Blend with the Desert Background (Site 8)

Source	Degrees of Freedom	Sum of Squares	Mean Square	F-Test	Level
Uniforms	7	177.8182	25.4026	11.5945	0.000*
Error	80	175.2727	2.1909		
Total	87	353.0909			

#### Bartlett's Test for Homogeneous Variances

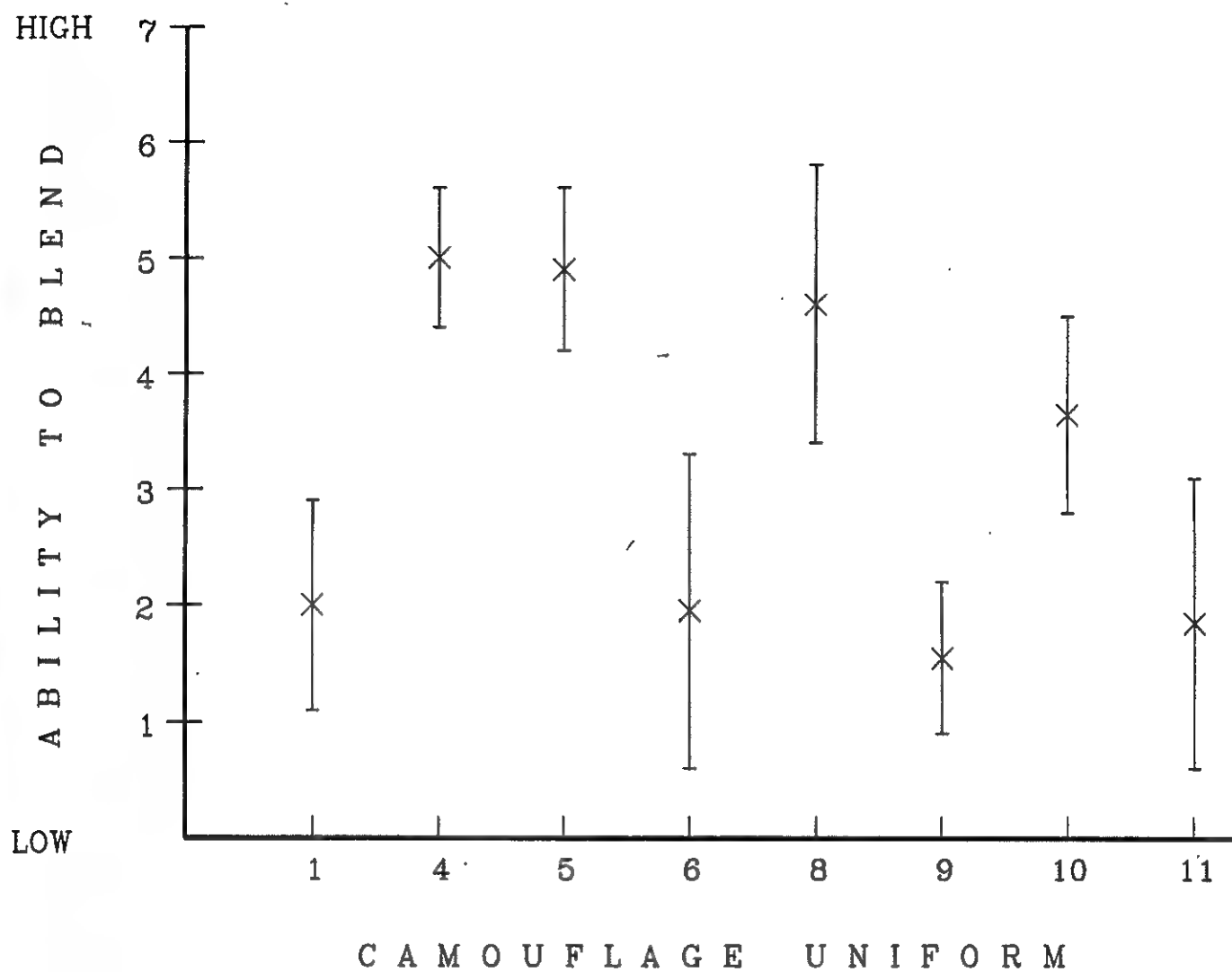
Number Degrees of Freedom = 7

F = 1.76748      Significance Level = 0.08870

\*Significant at  $\alpha$  less than 0.001 level

Table 48 indicates that there are significant differences in the ability of the camouflage uniforms to blend with the desert background. The Bartlett's Test indicates that the variance for each uniform is homogeneous, i.e., not significantly different, so they are from the same population.





**Figure 25. Camouflage Desert Uniform Ability to Blend with the Desert Background, Means, and 95-Percent Confidence Intervals (Site 8)**

**Table 49**  
**Individual Comparisons Identifying Which Camouflage Uniforms**  
**Differed Significantly from Each Other in the Ability**  
**to Blend with the Desert Background (Site 8)**

Uniforms	Uniform Comparison	Sum of Squares	F	Significance Level
#1 & #4	-3.00000	49.50000	22.593	0.00000***
#1 & #5	-2.90909	46.54545	21.245	0.00001***
#1 & #6	0.09091	0.04545	0.021	1.00000
#1 & #8	-2.63636	38.22727	17.448	0.00005***
#1 & #9	0.45455	1.13636	0.519	0.47237
#1 & #10	-1.63636	14.72727	6.722	0.01033*
#1 & #11	0.18182	0.18182	0.083	1.00000
#4 & #5	0.09191	0.04545	0.021	1.00000
#4 & #6	3.09091	52.54545	23.983	0.00000***
#4 & #8	0.36364	0.72727	0.332	0.56525
#4 & #9	3.45455	65.63636	29.959	0.00000***
#4 & #10	1.36364	10.22727	4.668	0.03209*
#4 & #11	3.18182	55.68182	25.415	0.00000***
#5 & #6	3.00000	49.50000	22.593	0.00000***
#5 & #8	0.27273	0.40909	0.187	1.00000
#5 & #9	3.36364	62.22727	28.402	0.00000***
#5 & #10	1.27273	8.90909	4.066	0.04527*
#5 & #11	3.09091	52.54545	23.983	0.00000***
#6 & #8	-2.72727	40.90909	18.672	0.00003***
#6 & #9	0.36364	0.72727	0.332	0.56525
#6 & #10	-1.72727	16.40909	7.490	0.00684**
#6 & #11	0.09091	0.04545	0.021	1.00000
#8 & #9	3.09091	52.54545	23.983	0.00000***
#8 & #10	1.00000	5.50000	2.510	0.11490
#8 & #11	2.81818	43.68182	19.938	0.00001***
#9 & #10	-2.09091	24.04545	10.975	0.00112**
#9 & #11	-0.27273	0.40909	0.187	1.00000
#10 & #11	1.81818	18.18182	8.299	0.00446**

The following camouflage desert uniforms differed significantly from each other in their ability to blend with the background: 1 vs. 4, 1 vs. 5, 1 vs. 8, 1 vs. 10, 4 vs. 6, 4 vs. 9, 4 vs. 10, 4 vs. 11, 5 vs. 6, 5 vs. 9, 5 vs. 10, 5 vs. 11, 6 vs. 8, 6 vs. 10, 8 vs. 9, 8 vs. 11, 9 vs. 10, and 10 vs. 11.

\*Significant at  $\alpha$  less than 0.05 level

\*\*Significant at  $\alpha$  less than 0.01 level

\*\*\*Significant at  $\alpha$  less than 0.001 level

### 3.2.6 Site Nine--Night

**Table 50**  
**Mean Preference Rating for Desert Background Blend**  
**and 95-Percent Confidence Intervals (Site 9)**

Uniform	N	Mean	Standard Error	95% Confidence Interval	
				Lower Limit	Upper Limit
1	11	1.2727	0.1166	0.4186	2.1269
4	11	4.3636	0.1395	3.4492	5.2780
5	11	5.1818	0.1558	4.3977	5.9659
6	11	2.5455	0.2438	1.7879	3.3030
8	11	3.0909	0.1852	2.1676	4.0142
9	11	0.8182	0.1178	0.0939	1.5425
10	11	4.4545	0.1591	3.3987	5.5104
11	11	3.7273	0.2101	2.4858	4.9687

**Table 51**  
**Analysis of Variance for the Ability of the Camouflage**  
**Uniforms to Blend with the Desert Background (Site 9)**

Source	Degrees of Freedom	Sum of Squares	Mean Square	F-Test	Level
Uniforms	7	186.5455	26.6494	14.1615	0.000*
Error	80	150.5455	1.8818		
Total	87	337.0909			

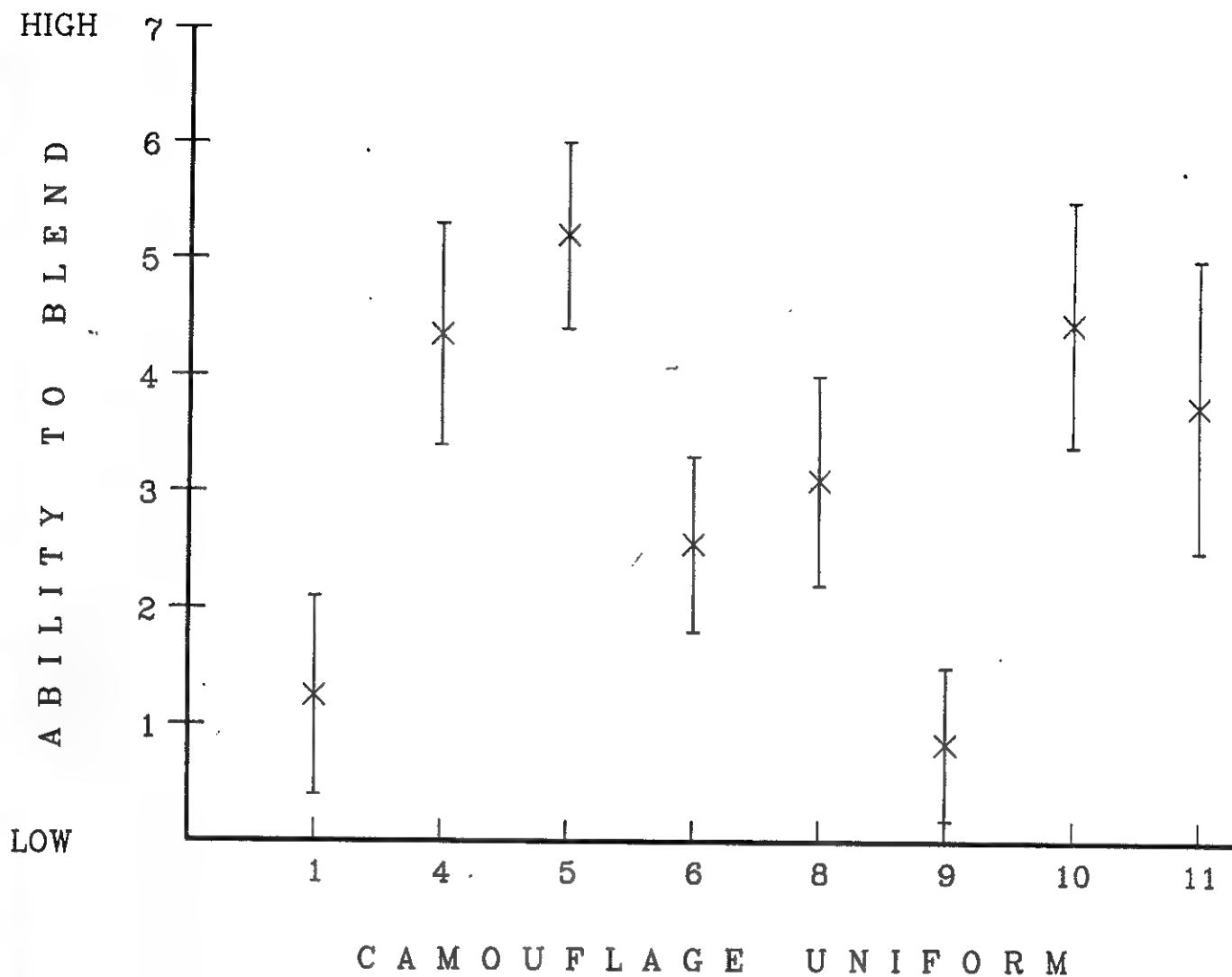
#### **Bartlett's Test for Homogeneous Variances**

Number Degrees of Freedom = 7

F = 0.66704      Significance Level = 0.70023

\*Significant at  $\alpha$  less than 0.001 level

Table 51 indicates that there are significant differences in the ability of the camouflage uniforms to blend with the desert background. The Bartlett's Test indicates that the variance for each uniform is homogeneous, i.e., not significantly different, so they are from the same population.



**Figure 26. Camouflage Desert Uniform Ability to Blend with the Desert Background, Means, and 95-Percent Confidence Intervals (Site 9)**

### 3.2.7 All Sites Combined--Night

**Table 53**  
Mean Preference Rating for Desert Background Blend  
and 95-Percent Confidence Intervals (Across All Sites)

Uniform	N	Mean	Standard Error	95% Confidence Interval	
				Lower Limit	Upper Limit
1	75	0.9200	0.1166	0.6876	1.1524
4	75	4.2000	0.1395	3.9220	4.4780
5	75	4.1733	0.1558	3.8629	4.4838
6	75	4.3067	0.2438	3.8208	4.7925
8	75	3.5733	0.1852	3.2043	3.9423
9	75	0.9867	0.1178	0.7520	1.2213
10	75	4.5600	0.1591	4.2430	4.8770
11	75	3.0400	0.2101	2.6215	3.4585

**Table 54**  
Analysis of Variance for the Ability of the Camouflage  
Uniforms to Blend with the Desert Background (Across All Sites)

Source	Degrees of Freedom	Sum of Squares	Mean Square	F-Test	Level
Uniforms	7	1146.0533	163.7219	74.5045	0.000*
Error	592	1300.9067	2.1975		
Total	599	2446.9600			

#### Bartlett's Test for Homogeneous Variances

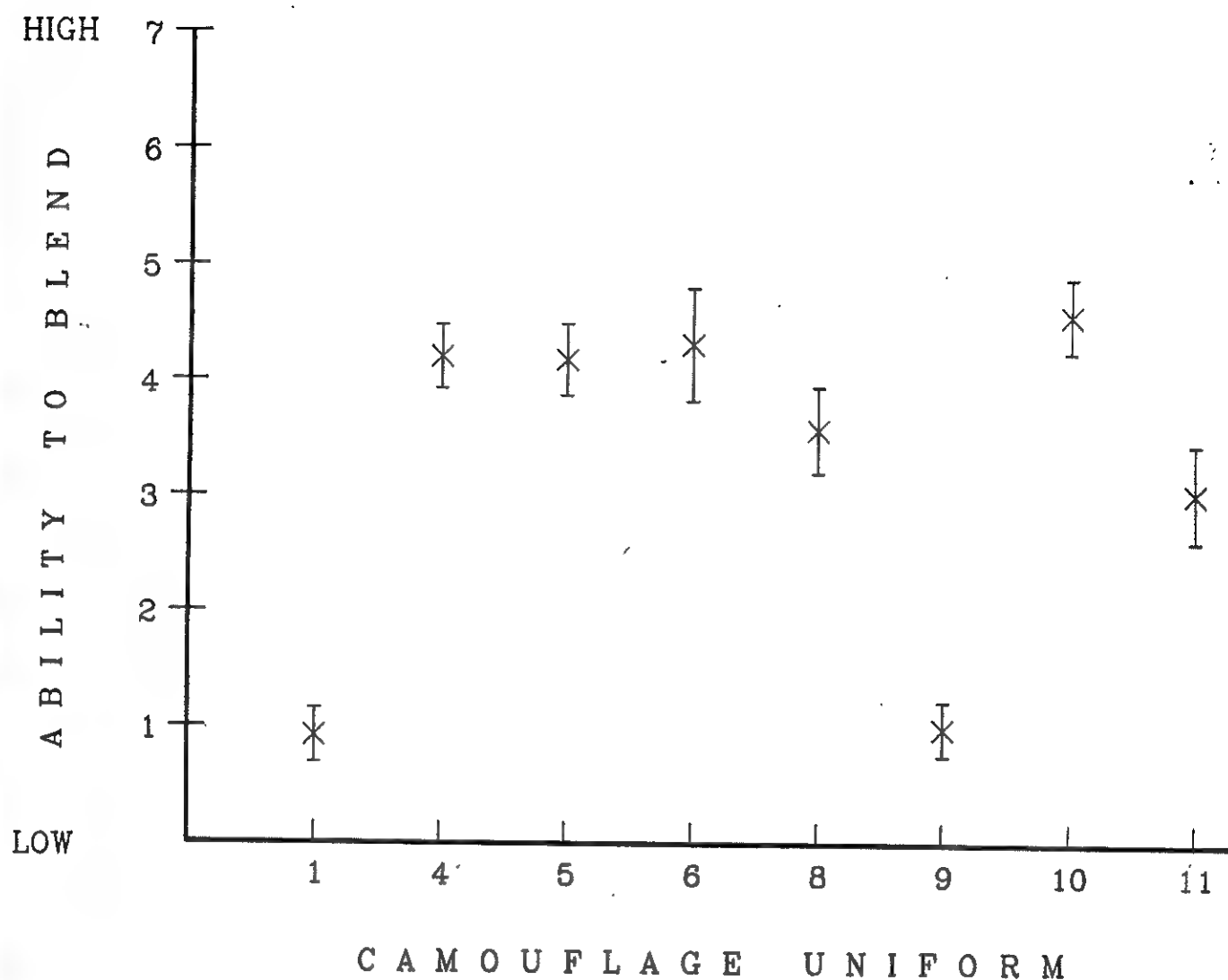
Number Degrees of Freedom = 7

F = 10.35

Significance Level = 0.000\*

\*Significant at  $\alpha$  less than 0.001 level

Table 54 indicates that there are significant differences in the ability of the camouflage uniforms to blend with the desert background. The Bartlett's Test indicates that the variance for each uniform is not homogeneous, i.e., significantly different, so they are not necessarily from the same population.



**Figure 27. Camouflage Desert Uniform Ability to Blend with the Desert Background, Means, and 95-Percent Confidence Intervals (Across All Sites)**

**Table 55**  
**Individual Comparisons Identifying Which Camouflage Uniforms**  
**Differed Significantly from Each Other in the Ability to Blend**  
**with the Desert Background (Across All Sites)**

Uniforms	F value	Significance Level
1 and 4	325.3548	0.0000***
1 and 5	279.3699	0.0000***
1 and 6	156.9936	0.0000***
1 and 8	146.9646	0.0000***
1 and 9	0.1617	0.6881
1 and 10	340.4411	0.0000***
1 and 11	77.8524	0.0000***
4 and 5	0.0163	0.8987
4 and 6	0.1442	0.7047
4 and 8	7.3054	0.0077**
4 and 9	309.7877	0.0000***
4 and 10	2.8947	0.0910
4 and 11	21.1632	0.0000***
5 and 6	0.2123	0.6456
5 and 8	6.1459	0.0143
5 and 9	266.1810	0.0000***
5 and 10	3.0149	0.0846
5 and 11	18.7781	0.0000***
6 and 8	5.7365	0.0179*
6 and 9	150.3301	0.0000***
6 and 10	0.7572	0.3856
6 and 11	25.4910	0.0001***
8 and 9	138.9059	0.0000***
8 and 10	16.3318	0.0001***
8 and 11	3.6272	0.0588
9 and 10	325.8722	0.0000***
9 and 11	72.7002	0.0000***
10 and 11	33.2747	0.0000***

The following camouflage desert uniforms differed significantly from each other in their ability to blend with the background: 1 vs. 6, 1 vs. 10, 4 vs. 6, 5 vs. 6, 6 vs. 8, 6 vs. 9, 6 vs. 11, and 9 vs. 10.

\*Significant at  $\alpha$  less than 0.05 level

\*\*Significant at  $\alpha$  less than 0.01 level

\*\*\*Significant at  $\alpha$  less than 0.001 level

#### 4.0 DISCUSSION

A review of the day data for sites 1-10, and for all sites combined (Sections 3.1.1 through 3.1.11), has indicated that camouflage uniforms 4, 5, and 8 are the most effective in blending with the desert terrain. These uniforms had a mean blending value of 4.3966, 4.7845, and 4.5000 respectively (Table 32). With the exception of site 5 (Table 14 and Figure 14), where camouflage uniforms 6 and 10 were judged as best blending with the desert background, uniforms 4, 5, and 8 had at least one member among those that blended best with the desert background. The overall mean blending values for uniforms 4, 5 and 8 do not differ significantly from each other statistically (Table 34). Additional review of the data indicates that the standard camouflage uniform, number 1, and camouflage uniform number 9 have the worst blend with the desert background, when averaged across all sites (Tables 32-34 and Figure 20).

The camouflage uniforms must be effective at night, as well as during the day. For that reason, sites 1, 2, 3, 4, 8, and 9 were used to investigate the ability of the uniforms to blend with the desert background, when viewed through an AN/PVS-4 night vision light-amplification scope. This scope presents the viewer a light green field of view with an ability to perceive texture and shadows. A review of night data and for all sites combined (Sections 3.3.1 through 3.3.7) has indicated that camouflage desert uniforms 4, 5, 6, and 10 are the most effective in blending with the desert terrain. These uniforms had a mean blending value of 4.2000, 4.1733, 4.3067, and 4.5600 respectively (Table 53). The confidence intervals for uniforms 6 and 10 are very large (Table 53 and Figure 27), which means that some observers did not think that these uniforms blended as well with the background as did uniforms 4 and 5 with their associated smaller confidence intervals. A review of Tables 35, 38, 41, 44, 47, and 50, along with Figures 21-26, helps explain the large standard deviations and confidence intervals for uniforms 6 and 10. These uniforms did not make the top group for background blending for sites 8 and 9, while uniforms 4 and 5 made the top or next to the top for blending



for all sites. As was the case with the day evaluations, uniforms 1 (standard) and 9 had the worst blend with the desert background when averaged across all sites (Tables 53-55 and Figure 27).

For the most part, the uniforms that blended best during the day studies with the desert background also blended best at night. The lone exception is uniform 6. It blended well at night with its mean blending of 4.3067 compared to 2.5345 for day evaluations (Tables 53 and 32). The large confidence interval for uniform 8 at night when compared to uniforms 4 and 5 tends to cast some doubts about its camouflage effectiveness. Thus taking into consideration all the data for both the day and night studies, uniforms 4 and 5 are the most effective for blending with the desert background. Uniforms 1 and 9 are the least effective. The data for this report appears fairly clean; however, one large and pressing caveat must be taken into consideration, before any final decision for desert uniforms is made. The uniform tests conducted so far have been in the U.S. desert Southwest. Any future conflicts in which a desert camouflage uniform will be used by U.S. forces will in all probability be in the Middle East. These deserts tend to be lighter and more tan in color than the grayer deserts of the United States. They also have much less vegetation. The best camouflage uniforms should be taken to the areas of interest in the Middle East for final evaluation as to color blend with the background. The resulting data may necessitate color modifications of the uniforms to assure that the best possible blend with the deserts of interest is achieved.

## 5.0 SUMMARY AND CONCLUSIONS

A total of eight camouflage uniforms were evaluated as to their ability to blend with desert backgrounds in the U.S. desert Southwest. A total of ten sites were used for the day study and six of the ten were reused for the night study. For both the day and night studies, the uniforms were viewed in all possible pairs (28). The AN/PVS-4 night vision device was used at night. For each pair of uniforms, the observers were told to select the one uniform

## REFERENCES

1. Letter Report, STRBE-JDS to U.S. Army Natick RD&E Center, *Development of an Effective Desert Camouflage Pattern/Color for Uniforms*, 11 July 86.
2. Natrella, Mary G., *Experimental Statistics*, National Bureau of Standards Handbook 91, U.S. Department of Commerce, Washington, D.C., 1966.